Independent guide to the BBC MICRO!

THE MICRO USER

Volume 3
Number 2
April 1985
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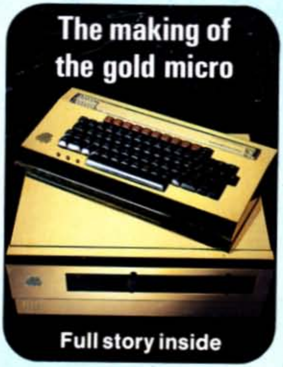


The making of the gold micro

Full story inside

How to teach the AMX mouse to do its sums

Visit Mornington Crescent or fly alien skies with this month's games specials

Dither your pixels for 27 new colours

Build your own A/D converter

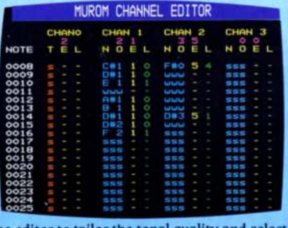
SERIOUS SOFTWARE
FOR THE B.B.C. MICRO AND ELECTRON
From BEEBUGSOFT

B.B.C. only

MUROM

The BBC Micro sound facilities have a lot of potential, MUROM will help you exploit this to the full.

Create your own tunes and sound sequences with ease, either with MUROM'S editor and a musical score or by using the Beeb to simulate a piano keyboard. Edit your creations with the full screen music editor. Then switch to the envelope editor to tailor the tonal quality and select instrument type. Alternatively select one of the predefined instrument envelopes.



```
              MUROM CHANNEL EDITOR

       CHANO    CHAN 1    CHAN 2    CHAN 3
         2        2 1       3 5       0 0
NOTE   T E L    N O E L   N O E L   N O E L

0008   s - -    C#1 1 0   F#0 5 4   sss - -
0009   s - -    D#1 1 0   www - -   sss - -
0010   s - -    E 1 1 1   www - -   sss - -
0011   s - -    www - -   www - -   sss - -
0012   s - -    A#1 1 0   www - -   sss - -
0013   s - -    B 1 1 0   www - -   sss - -
0014   s - -    D#1 1 0   D#3 5 1   sss - -
0015   s - -    D#2 1 0   www - -   sss - -
0016   s - -    F 2 1 1   sss - -   sss - -
0017   s - -    sss - -   sss - -   sss - -
0018   s - -    sss - -   sss - -   sss - -
0019   s - -    sss - -   sss - -   sss - -
0020   s - -    sss - -   sss - -   sss - -
0021   s - -    sss - -   sss - -   sss - -
0022   s - -    sss - -   sss - -   sss - -
0023   s - -    sss - -   sss - -   sss - -
0024   s - -    sss - -   sss - -   sss - -
0025   s - -    sss - -   sss - -   sss - -
```

Incorporate your music and sound sequences into any program of your own, to play back with or without MUROM plugged in. Playback is interrupt driven and may continue even while you run other programs.

Predefined instrument envelopes may be set up, e.g. *FLUTE, *SYNTH etc.

Instant sound effects may be called from Basic, e.g. *ZAP, *SIREN, *EXPLODE etc.

MUROM is accompanied by a full instruction manual and repertoire of music data on cassette.

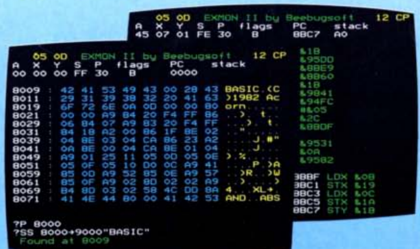
COMMAND SUMMARY

***PLAY**	Calls the variable speed, interrupt driven playback routine.
***DISP**	Mode 7 display of tune playing.
***TEMPO**	Alter tempo.
***KEYB**	Use BBC keyboard as a piano keyboard.
***SCORE**	Call up full screen music editor.
EDITOR SUB-COMMANDS:	
MODE	Change from editing a single channel to editing all channels consecutively.
GO	Move editor to any note in score.
PLAY	Enable single stepping of music.
OCTV	Change octave of any channel.
ENVL	Change envelope of any channel.
LOAD	Load previously created music.
SAVE	Save edited score to disc or cassette.
KEY	Toggle note entry between note name and keyboard position.
***ENVLP**	Sound envelope editor.
***FLUTE,**	***SYNTH** . . . etc. ten predefined envelopes.
***EXPLODE,**	***ZAP** . . . etc. ten predefined effects.
***TRANS**	Transpose up or down by a number of semitones.
***MONOC**	Disable colour output for monochrome screens.

B.B.C. & Electron

EXMON II

EXTENDED MACHINE CODE MONITOR NOW WITH DUAL SCREENS



```
     05 0D  EXMON II by Beebugsoft    12 CP
A  X  Y  S  P  flags   PC    stack
45 07 01 FE 30   B     8BC7  A0
                             &18
                             &95DD
                             &8BE9
                             &8B60
                             &18
                             &9841
                             &94FC
                             #&05
                             &2C
                             &8BDF

                             &9531
                             &0A
                             &9582

                           8BBF LDX &08
                           8BC1 STX &19
                           8BC3 LDX &0C
                           8BC5 STX &1A
                           8BC7 STY &18
```

```
  05 0D  EXMON II by Beebugsoft    12 CP
A  X  Y  S  P  flags   PC    stack
00 00 00 FF 30   B     0000

8009 : 42 41 53 49 43 00 28 43 BASIC.(C
8011 : 29 31 39 38 32 20 41 63 )1982 Ac
8019 : 6F 72 6E 0A 0D 00 00 80 orn.....
8021 : 00 00 A9 84 20 F4 FF 86 ..). t..
8029 : 06 84 07 A9 83 20 F4 FF ...). t.
8031 : 84 18 A2 00 86 1F 8E 02 ..".....
8039 : 04 8E 03 04 CA 86 23 A2 ....J.#"
8041 : 0A 8E 00 04 CA 8E 01 04 ....J...
8049 : A9 01 25 11 05 0D 05 0E ).%.....
8051 : 05 0F 05 10 D0 0C A9 41 ....P.)A
8059 : 85 0D A9 52 85 0E A9 57 ..)R..)W
8061 : 85 0F A9 02 8D 02 02 A9 ..).....)
8069 : 84 8D 03 02 58 4C DD 8A 4...XL+.
8071 : 41 4E 44 80 00 41 42 53 AND..ABS

?P 8000
?SS 8000+9000"BASIC"
 Found at 8009
```

60 New Commands for debugging and developing machine code

Our very popular machine code monitor has been enhanced by the addition of a number of new facilities, including Dual Screen Operation and full screen memory editor.

Now if you are debugging a game, or any other program with a visual display, you can single step through it instruction by instruction and actually watch the effect on the screen.

You can also revert to the monitor screen at the press of a key to examine registers, edit code, read variables, alter memory etc., and then switch back to your display screen and continue running (or single stepping), without losing your display.

Exmon II features include

- 60 machine code commands.
- Full dual screen operation.
- Full screen memory editor, input in hex, Ascii or as assembler instructions.
- Search for hex, or Ascii string, including wildcards.
- Move memory block.
- Verify that two blocks are the same.
- Relocate code to run at another location.
- Fill memory with series of hex bytes or Ascii string.
- Execute all * commands.
- Single step with skip option.
- Up to 10 breakpoints which may even be set in Rom.
- Conditional breakpoints . . . e.g. Break if register X=5.
- User definable work area.

Note: The Electron version does not feature dual screens.

BEEBUG SOFT

MUROM **£29.00** EXMON II **£29.00**

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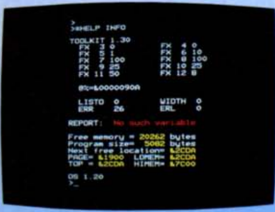
TOOLKIT ROM from BEEBUGSOFT

BASIC Programmer's Aid for the BBC micro



```
>
>*HELP INFO

TOOLKIT 1.30
  FX  3 0          FX  4 0
  FX  5 1          FX  6 10
  FX  7 100        FX  8 100
  FX  9 25         FX 10 25
  FX 11 50         FX 12 8

  @%=&0000090A

  LISTO  0         WIDTH  0
  ERR   26         ERL    0

REPORT:  No such variable

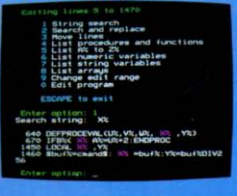
Free memory = 20262 bytes
Program size=  5082 bytes
Next free location= &2CDA
PAGE= &1900  LOMEM= &2CDA
TOP = &2CDA  HIMEM= &7C00

OS 1.20
>_
```

- **27 new commands to make life easier**
- **Saves hours in program development and debugging**
- **Supports both cassette and disc systems**
- **No command name conflict with other Roms**
- **Ideal for expert and novice alike**
- **Fitting instructions and a 32 page manual supplied**
- **You'll wonder how you ever managed without it**

SPECIAL FEATURES INCLUDE

SCREEN EDITOR An extremely powerful editor, allowing the use of cursor keys to list a program line-by-line in either direction and move to any part of a program to overtype or insert new code and corrections.



```
Editing lines 5 to 1470

     1 String search
     2 Search and replace
     3 Move lines
     4 List procedures and functions
     5 List A% to Z%
     6 List numeric variables
     7 List string variables
     8 List arrays
     9 Change edit range
     0 Edit program

     ESCAPE to exit

 Enter option: 1
Search string:  X%

  640 DEFPROCEVAL(U%,V%,W%, X% ,Y%)
  670 IFB%< X% A%=U%+2:ENDPROC
 1450 LOCAL X% ,Y%
 1460 $buf%=cmand$: X% =buf%:Y%=buf%DIV2
56

 Enter option: _
```

ERROR DETECTION Powerful facility to trap an error in a Basic program as it runs. It will then automatically enter the Screen Editor, display the line in error and position the cursor close to the statement at fault.

> "TOOLKIT is an essential utility for all Basic programmers using the BBC Micro. . . .an indispensable aid packed full of powerful utilities."
> EDUCATIONAL COMPUTING MARCH 1984

> ". . . highly recommended,"
> PCN MARCH 17, 1984

> "The Beebugsoft Toolkit costs £27 and in my opinion is worth every penny. Since it has been installed in my BBC it has been used extensively and I can find no fault with it. Highly recommended to lazy programmers!"
> COMPUTING TODAY JUNE 1984

COMMANDS

***CHECK**	Verify a program or data in memory with disc/cassette.
***CLEAR**	Clear all variables including integers.
***EDIT**	Enter full screen editor.
***FREE**	Display free memory and pseudo variables.
***HELP INFO**	Display a screenful of useful system information.
***MEMORY**	Display memory contents.
***MERGE**	Merge a program in memory with one on disc/cassette.
***MOVE**	Move program to run at specified address.
***NEW**	As NEW, but can be issued from within a program.
***OFF**	Cancel enhanced error handling.
***OLD**	As OLD, but can be issued from within a program.
***ON**	Auto error handling – enters editor at line in error.
***PACK**	Efficient program compactor.
***RECOVER**	Intelligently recover bad programs.
***RENUMBER**	Allow partial renumbering.
***REPORT**	Extended error reporting facility.
***SCREEN**	Screen dump to cassette or disc.
***UTIL**	Display utilities menu.
***UTIL 1**	String search.
***UTIL 2**	String search and replace.
***UTIL 3**	Move Basic program lines.
***UTIL 4**	List procedures and functions.
***UTIL 5**	List values of A% to Z%.
***UTIL 6**	List numeric variables.
***UTIL 7**	List string variables.
***UTIL 8**	List names of arrays.
***UTIL 9**	Set up range for utilities 1 and 2.

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How to teach the AMX mouse to do its sums
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Mike Cowley
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Tel: 061-456 8835 (Editorial)
061-456 8383 (Administration)
061-456 8500 (Advertising)
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Telex: 667664 SHARET G
Prestel Mailbox: 614568383

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ABC 68,328 January-June 1984

The Micro User welcomes program listings and articles for publication. Material should be typed or computer-printed, and preferably double-spaced. Program listings should be accompanied by cassette tape or disc. Please enclose a stamped, self-addressed envelope, otherwise the return of material cannot be guaranteed. Contributions accepted for publication will be on an all-rights basis.

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Another first from THE MICRO USER

Over the last two years *The Micro User* has built up an enviable reputation for giving its readers the first news of new products to enhance the BBC Micro, and in many cases giving them the chance to be the first to buy them – often at specially low prices.

This month is no exception. We've been testing a new teletext adapter from OEL, and we have been so impressed with the facilities it provides that we are making it the subject of our latest special offer.

There is ever-growing interest in downloading software from the TV screen. The BBC's own Telesoftware Service is expanding, and now Channel 4 is starting doing the same through 4-Tel.

With the new teletext adapter, now's the chance for you to join in this latest communications revolution.

Full details on Page 119

It's another* MICRO USER *special offer!

5
E-NET

And now we have E-NET series 5, still economic for five BBC's . . . or more.

It's a cut above any other educational network available.

Even faster than standard E-NET.

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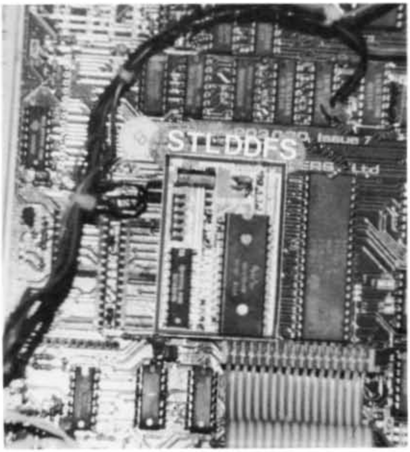
FROM SMALL ACORNS, SOLIDISK GROWS.

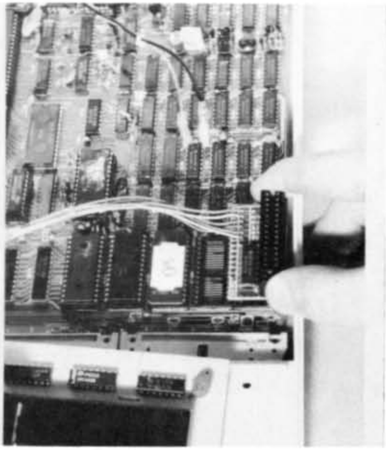
IN JULY 1983, we released the Sideways RAM for the BBC computer. We sold 5 in the first week, 10 in the second week, 20 in the third and one year later, we sell more than 500 in the UK and well more than 100 a week abroad.

By the time you read this, more than 30,000 Solidisk Sideways RAM boards will be beavering away in hundreds of schools and thousands of homes.

They are being joined by thousands of Solidisk DDFS each month. Soon, we hope, they will all be linked together by Solidisk Single Chip MODEM.

To support the users, a network of Solidisk Local Experts, covering the UK, Holland, France, Australia and Israel has been set up and expanding. Providing fitting and software for free.





SOLIDISK DOUBLE DENSITY DFS 1.5:
Single and Double Density.
Automatic Density Selection.
1 or Twin Drives, 40 and 80 Tracks, Single and Double Sided.
Automatic 40 and 80 Track Selection.
31 Filenames.
Low Cost.

SOLIDISK DOUBLE DENSITY DFS 2.0:
Virtually Unlimited Number of Filenames.
Automatic Tape to Disk.
Built-in Disk Fix and Disk Sector Editor.
Built-in Wordprocessor.
Does not Require DNFS With Z80 and 6502 Second Processors.

SOLIDISK SIDEWAYS RAM:
Add from 16k to 256k bytes of RAM to the BBC 32k RAM.
Useable for running Sideways ROM Software.
Useable in Networks or on BBC with Disk Drive(s).
Compatible With All Acorn Existing Products.
Including Econet, Teletext, 6502 and Z80 Second Processors.
Compatible With Most Sideways ROM Software.
Available Multi User Licencing Agreement from Leading Software Houses.
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Low Cost.
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Very large User Base, Extensive Free Software.
Local Help by Solidisk Local Expert Network.
Free Membership to receive Periodic Newsletters.

COMING SOON:
SOLIDISK is at present developing a state of the art MODEM. This will be compatible with the CCITT V23 and BELL 202 transmission standards at speeds from 5 to 1200 Bauds and will be based on the TMS 3105 single chip FSK MODEM manufactured by TEXAS Instruments.
The price is expected to be £39.95 inclusive of VAT.

We need you and your help. To make Solidisk Users the largest BBC Users Group. To share good ideas and good ways to use them.

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TEL. (0702) 354674 (10 lines).

HAVE YOU ALREADY GOT DISK DRIVE(S) FOR YOUR BBC COMPUTER?

OPERATIONS	S/D TIME	D/D TIME
FORMAT 40 TRACKS:	17.74	17.74
FORMAT 80 TRACKS:	33.22	33.22
VERIFY 40 TRACKS:	9.30	9.30
VERIFY 80 TRACKS:	17.84	17.84
BACKUP 01 80 TRACKS:	37.69	37.69
BACKUP 02 80 TRACKS:	39.46	39.46
COMPACT 100K-10 FILES	22.42	18.82

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RUNNING YOUR MACHINE
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THE SOLIDISK DOUBLE DENSITY DFS

If you take your Disk Systems seriously then there are very few viable alternatives to our new Double Density Filing System.

Anyone, with their ear to the ground, will probably have heard of the great shortage of the 8271 Floppy Disk Controller chip. This chip is, of course, the basis of all single density DFS upgrades for the BBC Microcomputer and is used extensively by Acorn, AMCOM and Watford Electronics in their respective DFS's.

This shortage can mean long delays or paying much inflated prices to obtain your Disk Upgrade.

Now, however, we at SOLIDISK have developed an alternative system with many advantages over the 8271 based upgrades. Not the least of these being continuation of supply of the FDC chip (Western Digital 1770) but, also, improvements in the speed and versatility of operation.

EASY TO INSTALL

The SOLIDISK DDFS comes complete with an easy to follow manual with step by step installation instructions, and can be fitted in just a few minutes by anyone with just the barest knowledge of the insides of their BBC.

The DFS contains just 4 IC's and 2 jumpers to be inserted and one link to be cut in the computer. This is compared to the usual upgrades which require 11 IC's to be fitted and the link to be cut.

EASY TO USE

The SOLIDISK DDFS Revision 1.5 contains many time and labour saving features. These include formatter, verifier, automatic density sensing, automatic 40/80 track switching and Single/Double Density mass copying etc.

COMPLETE CONTROL OVER THE DISK

SOLIDISK DDFS gives you complete control over your disk drive(s). You can use any combination of Single/Double Density, 40 or 80 tracks in one or two disk drives.

Every time the SOLIDISK DDFS accesses the disk it detects the density and the disc size in use and acts accordingly.
You can for example copy from a 40 to an 80 track disc on the same 80 track disk drive or even format a 40 track disk in an 80 track drive using the automatic disc size sensing in the DDFS. It is also possible to have one side of a disc formatted in Single Density and the other side in Double Density. Also copying between different densities is coped with automatically and, when using twin drives, is very fast.

GREATER DISC CAPACITY

When formatting a disk with the SOLIDISK DDFS you have a choice of the usual Single Density or the increased capacity Double Density.

Formatting in Single Density will leave your disk compatible with all other Single Density systems. However if the disk is formatted in Double Density it will have a 60% greater capacity than the equivalent size Single Density disk. This means that on an 80 track disk that the capacity is increased from the usual 400 kbytes to 640 kbytes of storage. The Double Density Format used is, at present, unique to the SOLIDISK DDFS and provides 16 sectors per track as opposed to the usual 10 sectors in Single Density giving a 40% saving in media surface for a file of given length over Single Density.

INCREASED SPEED OF OPERATION

As mentioned previously a disk formatted in Double Density uses about 40% less disk space per given length of file than does a disk formatted in Single Density or alternatively it holds 60% more information per track. This allows the, already fast, SOLIDISK DDFS to run very fast in the Double Density mode as demonstrated in the benchmark test on the next page.

BENCHMARK OUTSTANDING PERFORMANCE:

The table below shows the benchmark timing for STL DDFS 1.4. The benchmark consists of disk operations such as save and load a 16k program, open and close files, BPUT, BGET strings and numbers, format and verify a disk etc., and is available upon request, otherwise listed in Solidisk DDFS User Manual.

The benchmark tests B1 to B9 are the same as used by many reviewers. The time is expressed in seconds and parts of 100th of a second. The disk drives are twin 40/80 track double sided MITSUBISHI M4853, the diskettes are Verbatim Datalife MD 557 series, 96 TPI, double density, double sided, preverified to ensure that the media is free of all error and mechanical defects and containing solely the benchmark program. The test is loaded into memory, the drive motors are allowed to stop completely 2 seconds between tests. 10 timing samples are taken and the mean time is calculated automatically.
For example:

```
100 DEFFNb1:REM Save a 16k program.
110T% - TIME
120 *SAVE A 8000 +4000
130 - TIME — T%
```

Full listings are included in the User Manual.
This FN is called 10 times with 3 sec. interval, the mean result is printed as 'B1'.

BENCHMARK DESCRIPTION	S/D TIME	D/D TIME
B1 Save 16k	2.62	1.43
B2 Load 16k	2.45	1.23
B3 Openin and close 100 times	20.70	20.16
B4 Openout and print 1000 numbers (255)	5.84	4.66
B5 Openin and input 1000 numbers (255)	4.72	4.14
B6 Openout and print 100 80 bytes strings	6.18	4.91
B7 Openin and input 100 80 bytes strings	4.90	4.31
B8 BPUT 100 bytes (255)	3.01	2.06
B9 BGET 1000 bytes (255)	1.88	1.52

Note 1: Whenever a file is to be opened, STL DDFS automatically refreshes the disk directory, thus preventing erroneous disk change. Many other DFS's do not take the same care, although yielding a much shorter time, and this could accidentally stop the program.

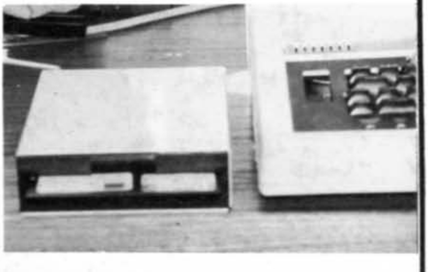
OPERATIONS	S/D TIME	D/D TIME
FORMAT 40 TRACKS:	17.74	17.74
FORMAT 80 TRACKS:	33.22	33.22
VERIFY 40 TRACKS:	9.30	9.30
VERIFY 80 TRACKS:	17.84	17.84
BACKUP 01 80 TRACKS:	37.69	37.69
BACKUP 02 80 TRACKS:	39.46	39.46
COMPACT 100K 10 FILES	22.42	18.82

With Wordwise:
Load 2000 words (17811 bytes) 16.80 sec. (41.40 sec. with AC).
With Scribe:
Count 2000 words (17811 bytes) 4.20 sec. (9.80 sec. with AC.90 DFS)
With Beebug's Masterfile:
Sort records 1 to 20 in PEOPLE sample database, the database is presorted on field 2 then the program is asked to sort on field 1, the time is then taken: 56.23 sec. (127.86 sec. with AC.90 DFS).
These timings are improved even further in double density mode.

The figures speak for themselves.

STL DDFS dramatically increases the operating speed of your software, including wordprocessors like Wordwise, View, Scribe, databases like Masterfile, Starbase etc.

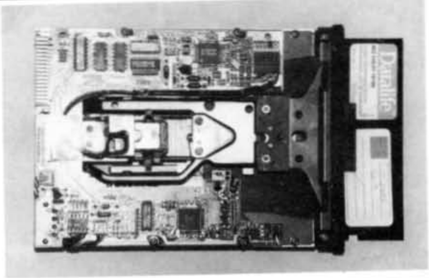
Solidisk engineers won't stop there.



MITSUBISHI DISK DRIVE:
From the new VLSI ultra quiet auto spin-up series comes the MITSUBISHI M4853. We have chosen it for its speed, quiet performance, low power consumption and state of the art design — look at the following features:
— new developments by Motorola and Mitsubishi largely reduce the area taken up by electronics, leaving more room for the diskette. This in turn implies lower noise levels and reduced friction on diskettes.

8 Slim 5.25" half height model attractively cased in BBC micro beige
— Reliability: we find that Mitsubishi compares most favourably with other makes
— Use your BBC own power supply —
— Single and double density available, plus ability ro read 40 track diskettes formatted elsewhere when used with our DFS.

Of course, we don't need to mention that all drives come complete with Dual leadds letting you add instantly a second disk drive and manual together with full guarantee on parts and labour.



EXTRA FEATURES OF SOLIDISK DDFS 2.0

With the production of the SOLIDISK DDFS 2.0 ROM we raise the already high standard of the previous DDFS 1.5 ROM.

The larger memory capacity of the DDFS 2.0 has allowed inclusion of a Wordprocessor and complete Disk Toolkit as well as a totally new concept in the working of the Disk Directory.

This will, we feel, make the SOLIDISK DDFS 2.0 ROM the most powerful Disk System currently available.

1) EXTENDED NUMBER OF FILENAMES

The standard number of filenames on the BBC microcomputer is limited to 3Ion most Single Density DFS's. This usually presents no problem on a system using 40 track drives but when using either 80 track drives and/or a Double Density Filing System this number will quite often be reached with a lot of the disk space still unused.

The SOLIDISK DDFS 2.0 ROM uses a unique and novel way to circumvent this shortcoming as every time a catalogue becomes full a new one is created. This gives the possibility of having up to 1502 filenames on a normal 80 Track Double Sided disk. Even with this large number of filenames worst case access taking only just over 2 seconds. Obviously with large files and a lesser number of filenames the access time decreases dramatically.

The way that the DDFS 2.0 ROM operates means that ordinary single catalogue discs are completely compatible with our system and, indeed, will be upgraded to multi catalogue once the number of filenames exceeds 31. This means no special formatting is necessary and that the disc remains compatible with other Single Density DFS's.

2) DISK TOOLKIT

Included on the SOLIDISK DDFS 2.0 ROM is a powerful disk repair facility. It is possible to read a complete track into memory and to repair or modify the data before restoring the track to the disk. If only one sector needs to be worked on then this too is possible with the Disk Sector Editor contained in the DDFS 2.0.

A powerful Disk Copy routine is also included to allow mmost non-standard format disks to be duplicated. This routine will also displaay the Sector I.D. Fields so that it is possible to see the makeup of the track being copied.

3) WORDPROCESSOR:

SOLIDISK DDFS 2.0 ROM contains a Word Processor with many excellent features such as 80 column screen, automatic on screen justification, Search and Replace, Block Move and Copy etc.

SOLIDISK+MITSUBISHI BIG DEAL:

This is exactly what you would receive:

— one double sided 80 track Mitsubishi M4853 disk drive, cased in beige.
— one Solidisk Double density disk interface (complete with STL DDFS 1.5 ROM) as described overleaf, giving a total capacity of 640K.
— Dual leads and instruction manual.
— 5 Software Diskettes containing a selection of the most prestigious programs written for the BBC.
— full one year guarantee.
—all for £209.95 including VAT and post and packing.

THE HARDWARE:
As described earlier and opposite.

THE SOFTWARE:
A selection of 6 programs based on ease of use, and popularity. All efforts are made so that you would not have to read the manual twice.
All programs feature on screen help (word processor) or option menus throughout. Mode 3 is used throughout whenever possible for good visual representation.

— Solicalc —
A Disc Based electronic spreadsheet made only possible with the speed of Solidisk DDFS. The sheet size can be as big as 170 kbytes. Written in modules, it is easily upgradable. Mode 3 screen. Goto, Calculate, Replicate, Automatic Header etc.

— Solidisk Datafile —
A fast, efficient and random access Database. Solidisk Datafile features:
— Compact size.
— 80 column screen throughout.
— 15 fields of 60 characters per card.
— Unlimited number of cards.
— Powerful Screen Editing allowing VERY FAST data entry on new cards or data correction on old cards.
— All Maths functions on ALL fields admitting Symbolic Variables (like A, B, C, D etc) for entering formulae.
— Special SORT program making use of any free disk space to avoid swapping cards.
— Standard options include View, Print using Tabulation, Print Labels, Search on any number of criteria and repeat on count, Amend, Create, Spool to disk, Append and Mailmerge with Solidisk Word Processor (requires EPSON compatible printer).
— Ability to read BEEBUG's Masterfile and possibly other systems later on.

— Solidisk wordprocessor —
On screen help, Wordstar style cursor editing and control keys, on screen justification while you type, Block commands, Quick commands and dot commands for mailmerge. Future development will allow reading Wordstar text from the Z80 second processor. Solidisk can offer Laser Typesetting and Page Planning service: it costs you only £1.00 for typesetting 1×A4 page (around 4,000 characters) from disk received by MODEM.

— Stock control —
useful for small businesses. Features include menu driven, easy to follow instructions, easy categorising. Stock evaluation reports and inventories, together with price lists and reorder forms can be printed automatically as requested.

— Silexicon — the most successful spelling checker with English, French and German dictionaries, together with self generating capability.

— Macrobasic —
a BASIC program generator capable of using bits of old programs to create new ones. Clever ideas — clever ideas of making them work!

Please note that this software is only free as prt of the package deal. It is otherwise avaiable at a cost of £14. Customers who would prefer the DFDC version of our disk filing system (see earlier) can purchase the package deal with this option for an extra £10.
What we may need to tell you is that the price is also agreeably low — check what we offer against any of our competitors — which all adds up to a high degree of sophistication affordable to students and businessmen alike.

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NOTTINGHAM
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READING
SHEFFIELD

TODDINGTON
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WIMBORNE
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WALES

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STL DDFS DISK UPGRADE	39.95
STL DFDC (goes with Acorn DFS)	49.95
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MITSUBUSHI 2×80 (INC LEADS	163.00
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MITSUBISHI 2×80	200.99
MITSUBISHI TWIN	353.00
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Please send me:

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		£
		£

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INTRODUCING THE DFDC!

For those who already have the Acorn DDFS installed in their computer and would like the advantages of increased speed and storage capacity that Double Density systems offer SOLIDISK have introduced a totally new concept in the shape of the DFDC!

The DFDC board simply sits in place of the 8271 FDC, this being reinstalled in the DFDC boaard. Now all that needs to be done is to install the DDFS ROM into a Rom Socket, to the right of the existing Acorn DFS, and two other minor connections.

Great Value at £49.95 inc.

HAS YOUR BBC COMPUTER GOT ITS SIDEWAYS RAM BOARD YET?

"Break the Ram Barrier" (A&B)

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HOW TO ORDER?

You can order any item using the coupon. Prices are inclusive of VAT, post and packing. Access and Barclay card holders can place their order by phone.
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CLARES Nº1 IN UTILITY SOFTWARE!

ENHANCED

BETA-BASE £25 DISC 8 GREAT FEATURES

WHAT IS A DATABASE?

It is a FILE which contains RECORDS. Records consist of a number of FIELDS containing the information—an analogy can be drawn with a card index in which a box of cards is the file. Each card is a record and each line on the card is a field.

SPECIFICATION

1) Random Access—disc based, single or dual drives
2) File Size—99K (40 track), 199K (80 track) —65,000 + records
3) Record Size—up to 2048 characters and 200 fields
4) Field Size—up to 254 characters with complete line scanning
5) Access any record using Primary Key in 2 seconds
6) Holds—1200 NAMES AND ADDRESS records on 100K disk
7) Search—500 records on 5 fields in 60 seconds
8) Sort—500 records on 3 fields in 60 seconds

SYSTEM FEATURES

- CALCULATE—using any valid expression and store results
- POWERFUL PRINTOUT OPTION—Eliminates need for separate mailing program, Parallel/Serial Printout allows setting of printer control codes, line spacing, tabulation, Headings etc. plus label printing with horizontal and vertical tab control.
- REDEFINE—Titles, field widths, number of fields, number of records etc.
- TRANSFER—Records from one file to another.
- SEARCH LISTS—Allow creation of sub-Databases within main Database.

NEW ✱

- GLOBALENTRY enables repetitive data to be typed in once and placed in as many records as required. Can also be used with a search list to provide a powerful global edit/update facility that will save hours of typing.
- SPOOLER enables you to create spooled files that are compatible with Wordwise, View and other word processors. You can therefore present your data within a document or in varying formats etc. The spooler program will allow to format your spooled file in the same way as the print out option. You can therefore have headings, columns, titles, numbers etc.
- INPUT is a routine included on the disc which will allow you to write utilities for accessing your data and tailored specifically to your needs.
- TUBE compatible with the 6502 second processor.
- Comprehensive manual and tutorial. All timings and sizes are relative to ACORN DFS. Compatible with ACORN DFS, WATFORD 1.3 and latest AMCOM DFS SERIES B.
- ORIGINAL USERS send your disc plus £3 for up grade.

REPLICA II: £12.00. DISC

The original REPLICA set a very high standard so the specification we set our chief programmer included some impossible features. In fact ACORN state that some of the things that we have done are impossible, it just took us longer that's all. REPLICA II transfers most cassette based programs to disk, even more than REPLICA. When you buy disk drives you do not have to throw away expensive cassette based programs.

REPLICA II transfers 'LOCKED' programs, programs loading as files, programs that load below &EOO, those with up to 6 sections and those up to &6E in length eg adventure programs. No waiting for 6 minutes whilst adventure programs load.

REPLICA II is very easy to use. The user enters a name, how many sections and whether CHAIN,*RUN or *LOAD to load the first section. Press play and let the program do the rest, even a menu.
Think how much it will cost you to buy just 1 disk version of your favourite program—REPLICA II which will hold up to 16 programs, limited only by the disk capacity.

FX 80 PRINTER DRIVER £12.00

PRINTER DRIVER FOR EPSON FX80 AND VIEW
Multi-page driver with print menu allowing the setting of global (document wide) printer functions at printer initialisation.
The print menu program contains a sophisticated character generator which allows the construction of 95 user defined characters which are then accessible from VIEW via a highlight option.

Supplied on disc with comprehensive user manual.

NEW

DISCDEX: £15.00 DISC

- Catalogues all your discs quickly and easily.
- Room to store four thousand titles.
- Quick search and load option.
- Compatible with single or dual drives.
- Extensive print options for catalogue and disc labels.
- Update and delete options.
- Supplied with stick on labels to number your discs and a supply of labels for printing your own disc labels.

DISCDEX is the answer to a disc users nightmare. How many times have you had to wade through your discs looking for the file that you know is there somewhere? Now with DISCDEX those days are gone.

DISCDEX will catalogue all your discs and store them in alphabetic order. In addition to the very useful search and load facility DISCDEX will also print out a full catalogue in alphabetic or disc order. Even more useful is the ability to print disc labels for sticking on the disc or the jacket.

DISCDEX is only suitable for discs with 31 file names as in the standard ACORN system. It is not suitable for double density interfaces.

NEW

ONESHOT: £12.00 DISC

- Full feature trace utility.
- Single step through BASIC program or halt at user determined interval.
- Print line number prior to execution.
- Obey fixed instructions before executing a line.
- Trace window allows screen to be seen whilst tracing execution.
- "Printer only" will force trace output to a printer allowing full screen display.
- Ability to dynamically alter control of ONESHOT.
- ONESHOT can be configured to run in any area of memory.

ONESHOT is a 1.25kb machine code program which gives the user several powerful aids in debugging BASIC programs. These include the ability to SINGLE STEP through the BASIC code of the target program, stopping the processing at specified points and comprehensive trace functions of the variables used by the target program.
A very powerful option allows the user to enter a command string into function key 0 and instruct ONESHOT to obey this command BEFORE each line is executed e.g. *KEY0 PRINT X%¦ M will print the value of X% before executing each line. This is a very simple example and it is possible to do much more complex things including printing the value of a variable only when it changes or when it reaches a certain value or falls within a certain range. This option can also be used to dynamically alter ONESHOT as it is working. The power of this option is only limited by the users ingenuity.
In addition to ONESHOT the disc also contains 3 very useful function key routines. The first will search for any DEFPROC or DEFFN and print the line numbers in which they appear together with the name of the procedure or function. The second will search for a specific procedure or function and print the line numbers containing it. The third routine will print out every active variable together with its present value. ONESHOT is not compatible with double density interfaces.

NEW

FUN HOUSE: £10.00 DISC

FUN HOUSE is a highly original suite of educational programs suitable for ages 3 to 13. The program is designed to encourage children to spell words which relate to objects found around the home. Animation and music are used to good effect and some highly original ideas are incorporated. Each room exercise is terminated with a warning item e.g. the lounge finishes with 'FIRE' which goes on to engulf the whole lounge. Tests with a newly hired 4 year old resulted in us having to prise him away from the keyboard after 2 hours. In that time he had gone from never having used a keyboard to finding the location of all the keys very quickly and entering the correct answer. He had thus started on the path to learning spelling and familiarised himself with the keyboard including the use of DELETE to correct his mistakes. Can you afford not to give your children the same start?

FUN HOUSE is not compatible with double density interfaces.

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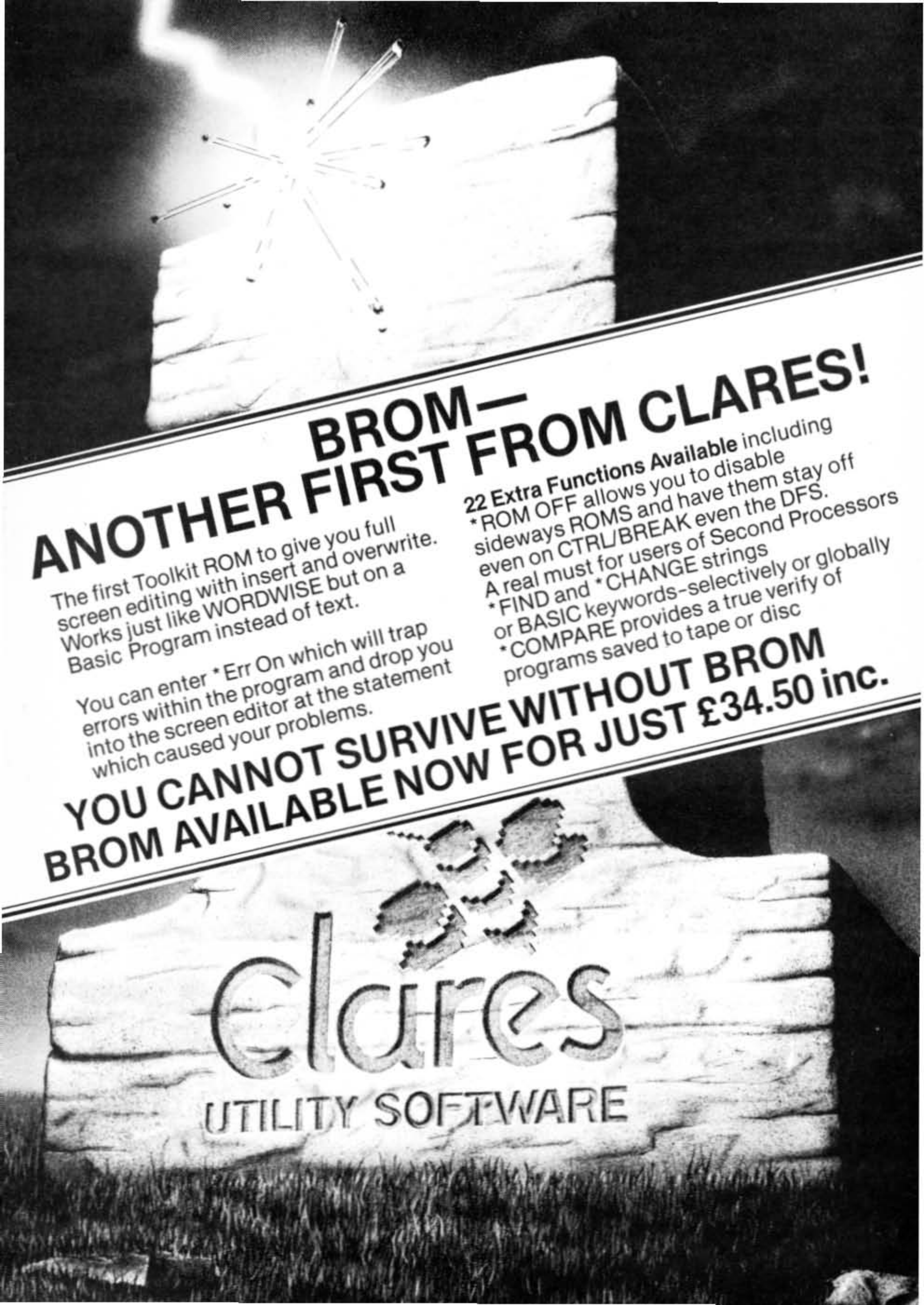

BROM—
ANOTHER FIRST FROM CLARES!

The first Toolkit ROM to give you full screen editing with insert and overwrite. Works just like WORDWISE but on a Basic Program instead of text.

You can enter *Err On which will trap errors within the program and drop you into the screen editor at the statement which caused your problems.

22 Extra Functions Available including

*ROM OFF allows you to disable sideways ROMS and have them stay off even on CTRL/BREAK even the DFS. A real must for users of Second Processors

*FIND and *CHANGE strings or BASIC keywords-selectively or globally

*COMPARE provides a true verify of programs saved to tape or disc

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BROM AVAILABLE NOW FOR JUST £34.50 inc.

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UPGRADE TO A DISC SYSTEM THAT'S DOWN TO £200.

For the incredibly low price of £199.95, Opus are giving you the opportunity to own a 5401 250K* 5¼" disc drive and double density disc interface – bought separately they would cost £249.90.

We're also extending the offer to our other high quality drives by reducing the price on our disc interface from £99.95 to £79.95 when bought with any 5¼" drive from the Opus range. This bargain also includes VAT, all necessary leads along with a two year guarantee.

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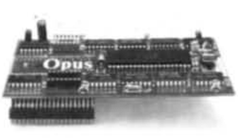
5802D 800K 1.6 Megabyte on line D/sided hardware switchable 80/40 Track	£429.95

DOUBLE DENSITY DISC INTERFACE.



The ultimate double density disc interface for your BBC Micro Z-80 and 6502 2nd Processor compatible.

- Utilities on ROM including: Format and verify, tape to disc transfer, automatic 40/80 Track selection, automatic density selection, unique mass copy routine, powerful machine code operating system giving up to 248 files, 80% faster than single density. Easy to install.

Free user manual supplied.	£99.95
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FLOPPY DISCS.

3" cartridge **£5.75** each or **£25.95** for 5.

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Now everyone with a BBC or IBM PC will want to get their paws on CUB's sleek new D series plastic cabinet – a triumph of ergonomics and up to the minute design. Within it is the CUB 653 MEDIUM RESOLUTION colour monitor – the perfect mate for computer users who wish to combine the advantages of brilliant, low cost colour graphics with 80 column processing software.

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AMX ART

AMX MOUSE

The AMX MOUSE is an advanced opto-mechanical device which brings to the B.B.C. micro facilities hitherto only available on more expensive machines. It enables you to use advanced features such as ICONS, WINDOWS, and POINTERS in your own programs.

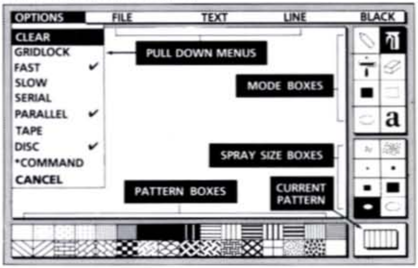
The AMX MOUSE can be used with ordinary programs to replace the cursor keys and with the AMX software it turns the B.B.C. micro into a far more user-friendly device, enabling beginners to quickly learn to use the computer for a wide range of purposes, including COMPUTER AIDED DESIGN, Word Processing, and a host of business uses – to say nothing of its inclusion in games software.

A further range of software will be released in 1985. Starting with "DESK TOP MANAGER".

THE AMX MOUSE PACKAGE

The AMX MOUSE – an advanced three buttoned mouse which simply plugs into the B.B.C. user port drawing its power from the computer.

AMX ART GRAPHICS PROGRAM



The AMX ROM – contains fast machine code routines for creating on screen windows, icons, and pointers and enables the MOUSE button to be programmed for use with commerial software such as Wordwise and VIEW.

Please send No.________ **AMX MOUSE** package/s
(including **AMX ART** and EPROM) at **£89.95** inc. VAT and P&P.
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Name ________________
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Signature____________ **Date**________
(Please tick choice of media for AMX ART) ☐ Cassette ☐ 3" Disc ☐ 5¼" Disc
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MU4/85

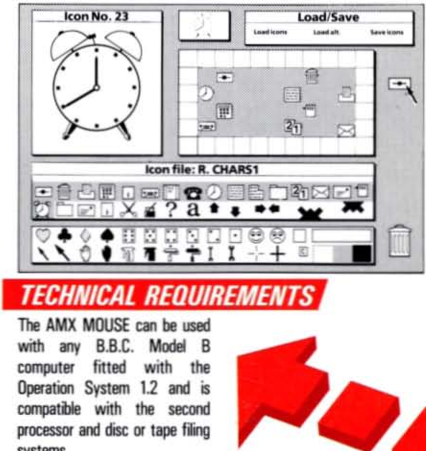
If not available from one of our main dealers, fill in the coupon and we will send you an AMX MOUSE with AMX ART with our full no quibble money back guarantee. OR phone 0925 602690/62907 for instant Access or Visa orders.

A MANUAL describing how to operate the MOUSE and the ROM routines which are available in both basic and machine code programs.

AMX ART – a superb computer aided drawing program on both tape cassette and a 5¼" floppy disc with its own manual. It is suitable for a wide range of uses including preparation of illustrations, architectural and engineering detail drawings, teachers' worksheets, and just creating your own pictures. It soon becomes addictive.

AMX ART includes full use of on screen menu boxes, icons, and pull down menus so that beginners find it very easy to learn and gain confidence in the use of the B.B.C. Micro.

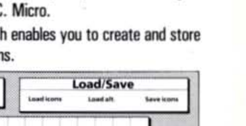
An ICON DESIGNER program which enables you to create and store icons for use in your own programs.



ICON DESIGN PROGRAM

TECHNICAL REQUIREMENTS

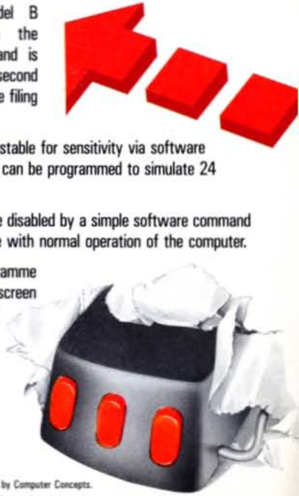
The AMX MOUSE can be used with any B.B.C. Model B computer fitted with the Operation System 1.2 and is compatible with the second processor and disc or tape filing systems.



The AMX MOUSE is adjustable for sensitivity via software control and three buttons can be programmed to simulate 24 different key codes.

The AMX MOUSE may be disabled by a simple software command and will then not interfere with normal operation of the computer.

The AMX ART programme enables users to print out screen displays using any Epsom compatible dot-matrix printer. Owners of non-standard printers may use their own screen dump routines.

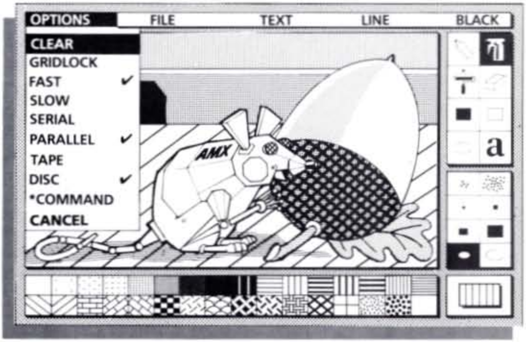


'Wordwise' is a wordprocessing program by Computer Concepts.
'View' is a word processing program by Acornsoft Ltd.

AMX MOUSE

POINTS THE WAY

FOR THE
BBC MICRO
MODEL B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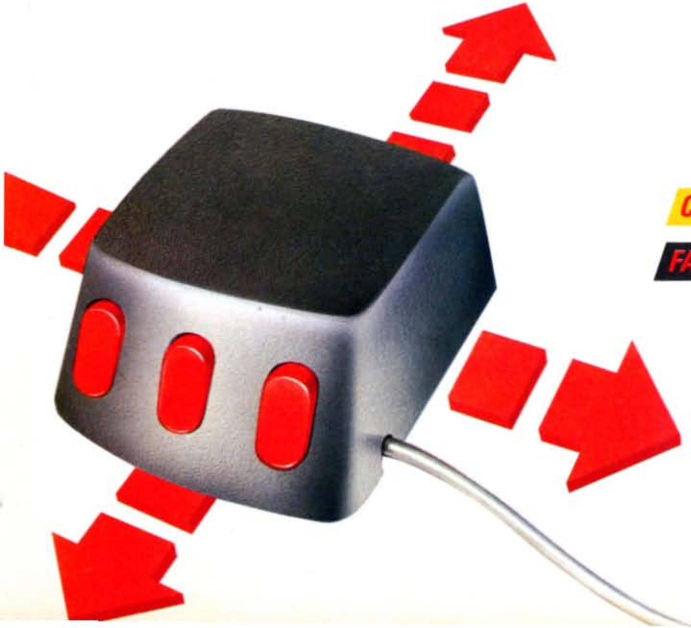

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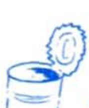

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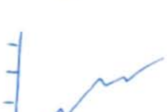

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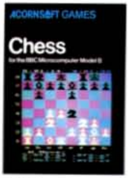
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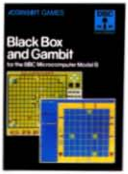
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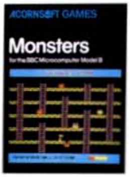
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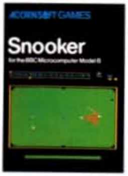
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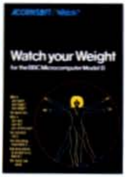
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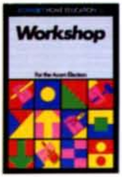
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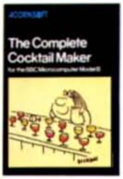
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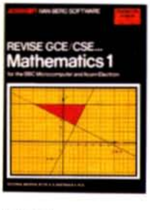
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THE MICRO USER NEWS

APRIL 1985

Reid is new chairman

A FORMER British Telecom senior executive, Dr Alexander Reid, is Acorn's new chairman.

A non-executive director of the Acorn group since January 1984, Dr Reid, 43, was educated at Trinity College, Cambridge, and at University College, London, where he took his MSc and his PhD in telecommunications studies.

His most recent post at British Telecom – from 1981 to 1983 – was as chief executive of British Telecom Spectrum.

Acorn's deal gets warm reception

A SURVEY of leading companies in the BBC Micro market has revealed that 90 per cent actively welcome the Acorn/Olivetti deal.

Only four per cent expressed disapproval while the remaining six per cent adopted a wait and see attitude.

The survey was conducted by *The Micro User* within days of the restructuring package being announced.

In all, 50 companies were contacted for their views, ranging from peripheral manufacturers to major dealers.

Of those positively in favour of Olivetti taking the largest single stake in Acorn, most hoped to see this as opening the BBC Micro up to more world markets. And, as a result, creating substantially more business for their own companies.

No one had any real reservations about Olivetti itself, preferring to accept the view from the City that the multinational's track record suggests it will ensure that Acorn will flourish.

Independence

However some of those contacted would have preferred to see Acorn maintain its independence had it been possible.

Typical of those firmly supporting the Acorn/Olivetti arrangement was John Rowland, merchandise controller of W.H. Smith.

"It's a terrific move. There is a lot of synergy between the two companies, for their ranges are complementary", he told *The Micro User*.

"It will help Acorn achieve its research and development potential and encourage the firm's innovative aspects".

Other comments from companies in agreement with what has taken place were:

"It may have been something of a shotgun wedding but we have little doubt that a long and successful marriage will result. For if, as it seems, Olivetti will enable the BBC Micro to be marketed world wide – then that's great for us" – **David Hood, Pace Software.**

Uncertainty

"I'm very, very pleased this has happened to settle the dust. The uncertainty was not helping anybody in the industry. Now professionals will run the company which has needed this type of management for years". – **Nazir Jessa, Watford Electronics.**

"I'm pleased Acorn has brought somebody in who will get their marketing sorted out. There is plenty of life left if they get their fingers out". – **Dave Clare, Clares Micro Supplies.**

"I'm very pleased about it. This solves Acorn's cash flow problems and opens up marketing opportunities in Europe. Their business

Turn to Page 24

Olivetti to the rescue

OLIVETTI, the Italian computer and office equipment group, has acquired a 49.3 per cent share of Acorn as part of the £18 million rescue package.

The deal sees Olivetti paying £10.39 million to become Acorn's largest single shareholder, with an option of further shares to increase its holding to a controlling 50.1 per cent majority.

Co-founders Dr Hermann Hauser and Chris Curry have now seen their combined equity in the company slashed from 85.7 to 36.5 per cent.

The top level package was agreed soon after dealings in Acorn's shares had been suspended at the company's own request.

This followed a dramatic slump in the price of Acorn shares on the Unlisted Securities Market.

At the time Olivetti stepped onto centre stage it was revealed that Acorn in fact had lost some £10.9 million during the last six months of trading in 1984.

In the main these losses were put down to the failure of Acorn to penetrate the American and German markets.

A new look Acorn will result from the company being divided into four divisions, each with its own managing director.

These are education and training, headed by Jim Merriman; scientific and industrial, Jeffrey Tansley; business, John Horton; and consumer, Peter O'Keeffe.

As part of the top level shuffle, Hermann Hauser and Chris Curry become deputy chairmen, with special responsibility for overall group strategy and external relations. In addition, they will also have line responsibility for specific product developments.

Two representatives of Olivetti are to join the board along with a new group managing director.

Olivetti executive vice-president, strategy and development, Elserino Piol, acted as the official spokesman for the Italian company when news of the deal was announced.

"We believe Acorn is a company with outstanding technical expertise", he said.

"With our backing, it will be in a strong position to consolidate its position in the UK, and to establish an effective presence in worldwide markets".

Comal for BBC Micro

COMAL, the high level language chosen for secondary school computing in Scotland, Ireland and Sweden, is now available for the BBC Micro.

Acornsoft has released a 16K sideways ROM based version of the language – similar to Basic and Pascal, but drawing on the better features of both – for £49.85.

The company says Comal is user friendly and minimises bugs by drawing attention to syntax errors as lines are entered. It also checks structure before the program is run.

Comal promotes structured programming, provides extensive parameter passing facilities for procedures and functions, supports strings and multi-dimensional arrays and facilitates file I/O through file handling.

To Russia with profit

THE persistence of Acorn Computers in sending its products to Russian computer shows has paid off with a £20,000 order for a 20 station BBC Micro network from the Moscow Education Institute.

The order, first of several expected to follow soon from other Soviet educational establishments, was clinched at the recent Moscow Computer Exhibition – the third occasion Acorn has shown its technology in the USSR.

The company has been working with UK distributor 3SL Overseas to win orders in the USSR.

A Russian version of the BBC Micro with Cyrillic as well as Roman alphabet has been developed jointly by the two firms.

Acorn International sales manager Owen Maddock said: "We are particularly confident of winning big orders from technical colleges and secondary schools who have recently been instructed by the Politburo to improve the level of their computer teaching facilities".

On the ball

NEW for the BBC Micro is a tracker ball graphics input device from Marconi, which comes with utility software and a free drawing package, Microdraw.

It plugs directly into the user port and costs £59.50.

A 2D draughting software package for schools and colleges that runs on the BBC Micro has been produced by Denford Machine Tools.

Easicad incorporates features associated with larger CAD systems including dimensions, symbols, text, hatching, plotting and four colours.

The system, price £495, runs on a BBC Micro with no additional hardware required.

DTI NEWSLETTER TAKEN OVER

TELELINK, a sister magazine to *The Micro User*, has been asked by the Department of Trade and Industry to take over the publication of the world's first newsletter devoted to teletext and viewdata.

Now Talk Teletext and Viewdata will be given a new look and appear as a supplement to *TeleLink*, which was launched last November to cater for the growing public interest in telecommunications.

The newsletter was originally started by the DTI's Information Technology division in May, 1981, to help promote the British teletext industry.

Since then it has expanded to cover the events in the viewdata industry. But recently the DTI decided it was time to pass responsibility for the publication to the private sector.

This decision coincided with the launch of *TeleLink* and, after discussions with a number of other publishers, the DTI asked the owners of *TeleLink* – Database Publications – to take over Talk Teletext and Viewdata.

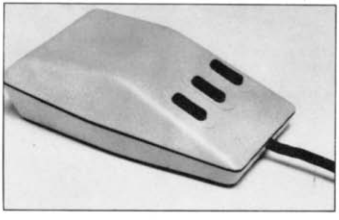
"We are delighted that the DTI should express its confidence in *TeleLink* by asking us to take this pioneering publication under our wing", says managing editor Derek Meakin.

"It has helped break new ground before and we'll be giving it a new look to ensure it maintains its impact within the teletext and viewdata communities, which are now well established in this country.

"As a supplement to *TeleLink*, Talk Teletext and Viewdata will enjoy a much wider distribution, both in Britain and overseas".

Quiet mouse..

TRACKBALL manufacturer Wigmore has brought out a BBC Micro mouse called Megamouse which incorporates a quiet, slip-free rubber ball.



The company says this is more accurate than imported metal ball versions.

Megamouse comes with a graphics package Mousepaint which operates in Mode 1, providing a choice of four from eight colours. Its main functions include rubber banding, painting with variable brush sizes, standard design shapes, save, load and print. Options are selected by picking off icon symbols.

No additional hardware or modifications are required since the software can be either cassette or disc.

Megamouse with Mousepaint costs £77. The optional Cadmouse package costs £24.

Acorn deal

From Page 23

machines in particular should benefit". – **Nick Pearson, AMS.**

"It's good news. This has removed the uncertainty about the future that was affecting us all". – **Hamayun Mughal, Akhter Computers.**

"We feel very confident Acorn will make a recovery with the help of Olivetti which will bring mature and responsible direction to the company's activities". – **Charles Forsyth, Microworld Computer Group.**

Companies adopting a wait and see stance told The Micro User:

"I'm pleased Acorn has been bailed out and is not going down but I've reservations about it being rescued by such a big international concern". – **Keith Manning, Care Electronics.**

"The end result of this could be good, but it's a little early to come up with any firm conclusions as yet". – **Victor Hinton, P & H Electronics.**

Micro monitors heart transplant patients

A BBC Micro is part of a new technique for assessing and monitoring candidates for transplant operations at the National Heart Hospital in London.

Patients who suffer from heart failure and are awaiting cardiac transplantation periodically have their fitness tested during treadmill exercises.

Measurement of oxygen consumption during these tests helps determine function of the heart and response to drug therapy, and is an alternative to the often painful methods involving needles and tubes.

Expired air from the patient is analysed with a machine called a spectrophotometer. The output from this machine is linked to the BBC Micro via an analogue to digital converter within the computer.

Research registrar Dr David Lipkin puts a transplant candidate through his paces on the treadmill at the National Heart Hospital.

Oxygen consumption, carbon dioxide production and the volume of air being breathed each minute are calculated by the computer and averaged so that a printout of the results is available every 30 seconds.

At the end of each exercise test the computer prints graphs of change in oxygen consumption and the amount of air consumed with time on the treadmill.

Each patient's data is stored on floppy disc for future referral. Transplant candidates undergo the test every two or three months until their operation.

BBC SPEEDS ANSWERS TO DRUGS QUERIES

MORE than 100 sales representatives employed by Ciba-Geigy Pharmaceuticals have been equipped with BBC Micros to speed up their response to queries from doctors and hospitals.

The national network, linked to the company's headquarters in Sussex, went live in March and will reduce from one week to 48 hours the time it takes to reply to requests for drug information from the medical profession.

And the increased efficiency will save Ciba-Geigy money. The entire network will be run for two-thirds the cost of the previous area office system for the Ciba branch alone, says general sales manager Paul Harrod.

Ciba-Geigy already has experience of using BBC Micros to present case studies to doctors and in hospitals, where the machine proved a successful training aid with interactive programs.

Before the new network went live, the sales force was able to get hands on experience of up to four weeks.

Says Harrod: "This is not a means of increasing drug sales. The major role of representatives in the pharmaceutical industry is imparting information and helping members of the medical profession in the application of drugs.

Many queries concern the effectiveness of a particular drug in a certain clinical condition and prompt answers are necessary in the interests of patients.

"Actual times to respond depend very much on the complexity of the question but anything we can do to speed the process is welcome.

"One of the things we have noticed about being on a viewdata system is that people use far fewer words to get their message across".

The firm's network is based on a private viewdata system on British Telecom. It involves 110 sales representatives, 16 area managers and a team of specialists concerned with teaching hospitals.

Sysops are getting younger

OUR story on Viewfax 258 Tubelink editor Benjamin Rietti (*The Micro User*, January issue) prompted another youthful IP, Matthew Lemmings of Staines, to tell us about his own BBC Micro users' service on Micronet.

At 14½ Matthew is six months younger than Benjamin, which makes him a candidate for the title of Prestel's youngest information provider.

Coincidentally, the boys are close friends and often meet at shows.

Matthew, a pupil at Churchmead School, Datchet, near Slough, started with the Viewfax Hotline when he was only 13 years old.

He moved to Micronet last September.

His InfoBeeb database on Prestel Page *8001127 carries a tube users' section, news pages, reviews of software, hardware and computer books, hints and tips, a RAM users' directory, technical help and competition pages.

There is also a Top Scores section for games players.

... and younger

PROVING you're never too young to be a sysop, 11-year-old London schoolboy Marcus Anselm has started a bulletin board for fellow BBC Micro users.

Marcus has written all the software himself and says he is improving his board – called Marctel – all the time.

Latterly that includes adding electronic mail and a new special interest groups menu in which users can deselect Sigs.

Marcus says his only problem is that his times are very restricted as he doesn't have an auto answer for his Pace modem.

This means – homework permitting – he can only man his telephone – 01-346 7150 – between 8 and 9pm during the week and for five hours on weekends.

However, good news for Marcus and other sysops like him is that Pace has promised its auto dial/auto answer add-on cartridge should be in the shops this month, priced £45.

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Sanyo MBC 550 16 bit Micro single drive	599.00
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(above include Wordstar, Calcstar etc.)

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Hopetoun Street,
Edinburgh EH7 4NF
031-556 0191 x240

Boost for Mini Office

MINI Office, the chart topping business package for the BBC Micro from Database Software, has been officially endorsed as an aid for the handicapped.

The software is specifically recommended in "Micros for Handicapped Users", a book published by Helena Press of Whitby, Yorkshire. It carries a foreword by Baroness Masham of Ilton.

Revolutionarily priced at £5.95 – business packages can cost up to several hundred pounds – Mini Office is a suite of four programs.

All professionally written, they are made up of a word processor, database, spreadsheet and graphics.

The software package is singled out in the book in the chapter "Jobs for housebound people", which deals with the handicapped contemplating setting up their own businesses.

"We found Mini Office very useful", Peter Saunders of Helena Press told *The Micro User*.

WORDS FROM THE WISE

THERE's help on the horizon for the 40,000 users of Wordwise, the first ROM-based word processor to be produced for the BBC Micro.

Paul Beverley, of Norwich Computer Services – a Wordwise user for the last two years – has written up his accumulated wisdom on the use and applications of this firmware.

The Wordwise Applications Guide costs £6.50 and gives help for beginners, offers solutions to all the most common problems and demonstrates a wide range of new applications which extend the value of the Wordwise chip.

Bulletin board software to be released soon

THE first commercial bulletin board software for the BBC Micro is currently undergoing trials ready for release shortly, and it is in teletext Mode 7.

The package is coming out of the Pace stable, already well known for its Commstar communications package for the BBC and the Nightingale multi-standard modem.

It has been written by Robert O'Donnell who has been operating his own bulletin board in Manchester for some months.

David Hood of Pace said: "We have a number of exciting new products coming out and this is one of them. It is undergoing trials at the moment to see how it operates with our auto/answer auto/dial board for the Nightingale".

The new card for the Nightingale mounts into three existing sockets. "It is very simple to insert and soldering is unnecessary", said David Hood. Price is expected to be around £45.

Pace plans to sell the bulletin board package – some sources suggest for as little as £15 in a pre-configured form – and a more powerful version at a higher price.

The software will require a minimum of 100k disc storage and even that will be tight for much additional special interest group material and messages.

"It will work with that basic capacity, but really it could need either a double sided 40 track drive or 80 track drive for maximum message storage", said David Hood.

HELPFUL BEAMS

YOUNG children and the disabled are two important groups who will benefit from the new Microvitec Touchtech 501 touch screen for the BBC Micro.

It works by projecting a network of harmless infra-red beams across the face of the screen. Once the sensors detect that the network has been broken the coordinates are fed to the host computer which is programmed to interpret a signal from that part of the screen in a certain way.

The technique enables any stylus or a finger to be used. It costs £210.

Cleaner power all round

A POWER distribution unit has been developed by Total Business Services that has seven power outlets, of which six are mains interference filtered, leaving the printer outlet independently wired.

The mains interference filter has approximately 30 db attenuation over the range 1600 KHz to 100 MHz.

The front panel contains eight individual neon light switches. A hinged flap at the rear allows access to the sockets which accept 13 amp plugs.

The power unit is supplied with two metres of inlet cable and costs £119.50.

German recorder on its way

THIS German data recorder, already the undisputed leader in its home market, is poised to invade the BBC Micro scene in the UK.

Whereas most recorders used with micros are modified music cassette machines, the MC 3810 from Waltham Electronics of Munich is specially designed for data processing.

Priced at £26, it is supplied with an interface cable (£3.95) to make it compatible with the BBC Micro.

It has a precision tape drive, data transfer rate of 1200 baud, motor control via CPU, as well as automatic level and shut off controls.

All sockets for interface cables and power are on the back panel of the casing, with the monitor plug on the front.

A series of lamps display the "Ready", "Save", "Load" and "Control" functions, while the 3810 also boasts an oil damped cassette eject and tape counter.

The read/write head is easily adjustable from the outside – "this is a most important feature", said Waltham's Roman Hummelt.

The German company has signed an agreement with Twillstar Computers to act as distributors for the MC 3810 in the UK.

SOFTWARE, FIRMWARE AND HARDWARE FOR YOUR BBC MICRO

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107 MEMO-CALC £12.95 B C/D
"IT MUST BE AMONG THE LEAST EXPENSIVE PIECES OF USEFUL SOFTWARE YOU WILL EVER BUY" Revue by Practical Computing July 1983.

Database/calcsheet program which allows up to 255 columns. The number of rows is automatically set from 5 to over 1000 depending on the columns declared. Both numeric and alphanumeric data can be stored in any cell and can be of any length up to 255 characters.

There are a multitude of uses for this program from accounts to diaries, club or personnel records etc. and is probably the one program that we all need. MODE7
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Part 1 is a BASIC program running in MODE7 which accepts new data on employees, allows additions, deletions and alterations, listing of P35 & automatic alterations to the codes as required by tax notice P7X. Fully 'user friendly' with colour and graphics to make life simple for the operator.
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FIRST CHOICE This is a double entry cashbook program showing cash and bank credits and debits, i.e. 4 columns. Any number of individual accounts can be used and analysed or totalled individually or cumulatively by associated group. A friendly but very practical, and reliable program which despite its low cost is used by many people in a range of situations from domestic and clubs to schools and businesses. MODE7
102d CASHBOOKd £19.95 B D
SECOND CHOICE This version of the above program uses random access disc files and can hold up to 1250 entries on 100K discs and up to 2500 on 200k discs. There is sophisticated protection against unauthorised use built in. MODE 7

102f ACCOUNT £29.95 B D
THIRD CHOICE This version of the above program uses random access disc files and can hold up to 1100 entries on 100K discs, and up to 2250 on 200K discs. Included is a choice of CASH/BANK or VAT/BANK headings. Over 830000 possible accounts combinations. Ledger sheets and summaries can be printed as well as full accounts. The latest balance is available at any time. This program is only available on disc MODE 7

Special Interest Items

NEW EXTENDED PAYROLL

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RANDOM MAILING up to 1850 addresses, names, phone numbers & codes on one disc. Selective printing any number of labels, repeat, stationery or fan fold. Automatic WORDWISE letters produced repeatedly with personalised names many other features such as automatic sorting by company or personal names. By far the best and most comprehensive program of its type for the BBC Micro
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Three more major shows

DATABASE Publications is to organise three Electron & BBC Micro User Shows this year.

Two are to be held in London, with the third in Manchester. All will be returning to previous venues.

"Whereas some computer show organisers have been experiencing problems of late – IPC has even cancelled events – we expect once again to break previous attendance records", says Derek Meakin, head of Database.

Dates and venues are:

May 9 to 12: New Horticultural Hall, London SW1.

September 27 to 29: UMIST, Manchester.

November 14 to 17: New Horticultural Hall, London SW1.

Show contacts: Christine Lees/Pam Goodwin, Database Publications. Tel: 061-429 8157.

Slavish service

THE slave market beckons for BBC Micro owners. A & F Software has moved into the world of firmware with the introduction of a 16k eprom called The Slave.

The firm says its research has shown that the programmers' ideal eprom would encompass all the good points of ROMs already on the market.

And it claims The Slave fulfills this ideal and provides more routines the programmer will find indispensable.

"It has extensive routines to cover all requirements and comes with a 64-page operational manual, The Slave Drivers Guide", a spokesman said.

The Slave is initially available by mail order only from A & F Software and costs £49.95.

New network brings in £6 million orders

ACORN'S new "streamlined" distribution network has already brought in orders worth more than £6 million for BBC Micros and Electrons.

The number of distributors was recently cut from 17 to six in a move which the company maintains will introduce stability into the marketplace.

Acorn's distributor network for England and Wales now comprises 3SL, Eltec, Hugh Symons, Lightning, LVL and Micro Management.

Computerworld remains Acorn's distributor for Scotland, while CEM and Lendac will continue in Ireland.

Nearly all of Acorn's 2,000 independent dealers will now be serviced entirely by the new distributor network.

Chris Hall, Acorn's UK sales manager, said: "Independent dealers account for over half our sales, particularly in the business and education sectors.

"This new strengthened network, with its increased emphasis on support, will not only help independent outlets to compete on an equal footing with the multiples, but ensure that they can successfully handle the evolving product lines of Acorn's 1985 marketing strategy".

Acorn claims that improved margins will enable the remaining distributors to offer dealers "better support and in turn help them to improve customers service".

However not all dealers appear to be entirely happy with the new arrangements, with at least one claiming his profit margin had been effectively slashed to £6 for every Electron sold.

"This just isn't true", insisted an Acorn spokesman.

TV review

ANGLIA Television plans to launch a regular review of computer software for the BBC Micro.

The series will concentrate on games programs, but will include educational, strategy and adventure gaming as well as arcade action.

MICRO MENUS

STUDENTS at catering colleges all over the country are learning to cook with the help of the BBC Micro.

Shumwari Associates has produced a set of programs called Menu Master based on Practical Cookery, the book that has been the bible of catering colleges for years.

The programs, which cover more than 400 ingredients and 750 recipes, were designed with the help of a leading catering college

Sorting out your circuits

THE BBC Micro has proved to be one of the most reliable home computers on the market. However, should something go wrong you may find your dealer doesn't offer a repair service or, if he does, you're in for a long wait.

Fortunately a number of firms offer repair services. One of them is Rumbelows, which has 40 service clinics across the country staffed by BBC maintenance experts.

Rumbelows' computer engineers undergo an intensive training period to develop their skills and are also qualified to install peripherals such as disc drives, Econet, word processors and printers.

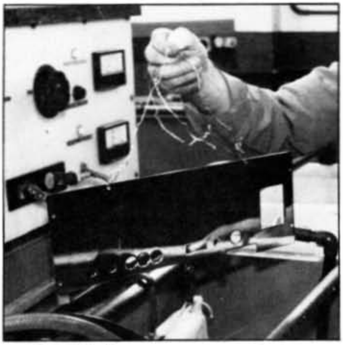
They use a range of equipment to locate the problem, including an oscilloscope which checks the signals present on each of the integrated circuits.

However, as any service engineer will tell you, the hardest part of his job is repairing a computer with which it is impossible to communicate.

This is what the PET – progressive establishment testing system – is designed to handle. By connecting the PET to the main board of your micro (see picture) the engineer is able to run a sequence of tests which starts from the central core of the computer and progressively establishes the operation or malfunction of the components.

After the fault is located it is usually a straightforward job to put right and when the repair has been carried out the machine gets a final check before being returned to its owner.

From copper

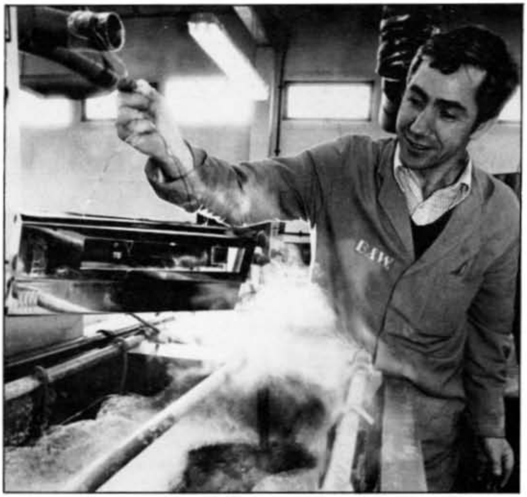


. . . to nickel

The making of a golden micro . . . .

A GOLD BBC Micro! Since it was announced that *The Micro User* was giving one away to celebrate its second birthday, the idea has captured the imagination of the computer world . . . and far beyond.

News of the fabulous prize – valued at £5,000 but considered priceless in that it is unique – has even reached those most discriminating of people at London's top store, Harrods.



. . . to gold

Now top store may sell them to Arabs

Now consideration is being given to making more gold micros to sell to oil-rich Arabs out in the Middle East.

"I'm sure that many of our wealthier customers would be pleased to own something like this", a spokesman told *The Micro User*. "This really is the gift for someone with everything".

All of this is not really surprising in the light of the fact that *The Micro User's* gold micro has been made to the most exacting standards.

It was commissioned from the Universal Communications Company, based in Bradford, West Yorkshire. Now No. 1 in the field of customised casings for the BBC Micro, UCC markets its products under the Oak label.

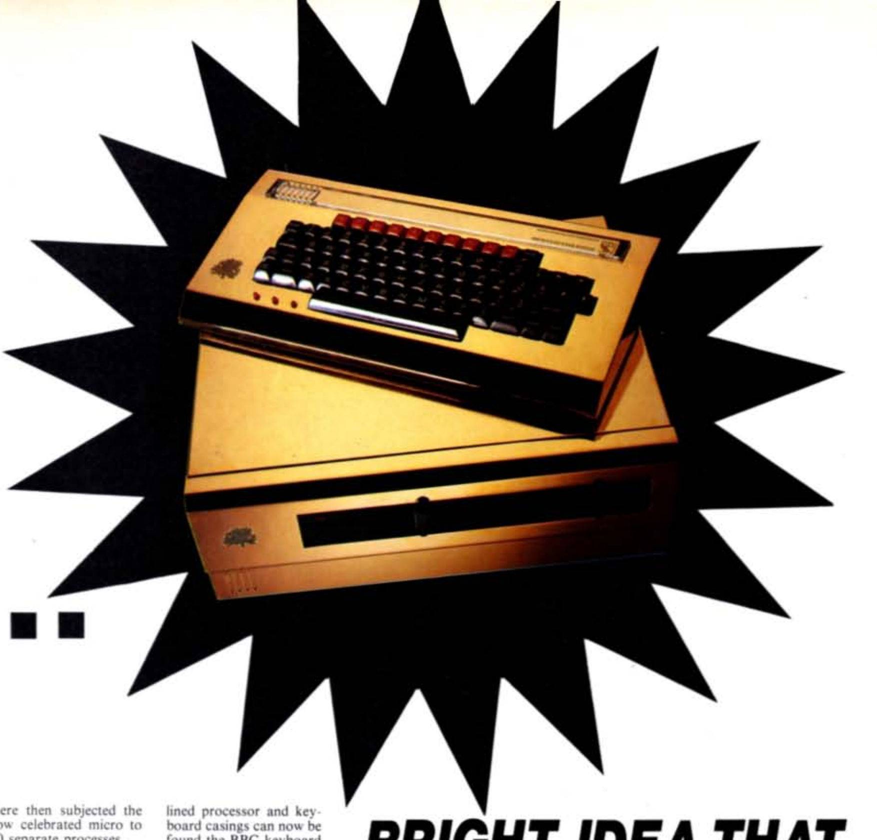
In all, David Atkins and his UCC team lovingly lavished attention on the making of the gold micro for one whole month.

The base units were painstakingly hand made out of soft steel to ensure the perfect finish needed to guarantee that the gold dipping would be a success.

For hour after hour the casings were then spindle polished by a craftsman ready for the birthday micro to be clad in its golden coat.

Both parts were then shipped at high speed – to alleviate the problem of them becoming contaminated during the journey – to a specialist company, B. & W. Plating, near Crawley, Sussex.

Time served craftsmen



there then subjected the now celebrated micro to 20 separate processes.

Working round the clock, they began by dipping the casings in tricoethyln in order to remove any grease that may have been picked up during the trip from Yorkshire.

A limed rag was then used to eliminate any surplus dust or grit.

The next critical stage saw copper wires attached to the casings so that dipping could begin.

Lowered in turn into cyanide and sulphuric acid solutions, the casings were then ready to be flashed in copper cyanide for their essential copper undercoatings.

Without this and the subsequent bright nickel coating, the gold plating process would not be lasting.

Finally, it was time for the casings to take the world's most expensive bath in a vat of 22 ct gold.

Within the gold streamlined processor and keyboard casings can now be found the BBC keyboard and motherboard, a disc interface, two 1mbyte disc drives and an 85 watt power supply unit.

"One thing you can say for certain is that whichever Arab sheikh eventually buys a gold micro, he will be second in line to the winner of *The Micro User* contest", says David Atkins of UCC.

"This is the first and, as such, will remain the most valuable in the world . . ."

Polishing the casing before plating began

BRIGHT IDEA THAT PAID OFF

BEHIND the Oak computer range are a husband and wife team and a brilliantly simple idea.

Ann and David Atkins had a wealth of business experience behind them when they started Oak ten months ago, she in commercial management and he in sales.

What brought their previously separate career courses together was a high-tech application of an old adage: "It a man builds a better mousetrap the world will beat a path to his door . . ."

In this case the "mousetrap" was the BBC Micro – a first rate machine with great potential for business applications.

Only one problem – when you added the peripherals and wiring necessary to turn the BBC into a sophisticated business tool the end result looked anything but businesslike.

Ann and David Atkins came up with the simple solution – make the BBC Micro look as sophisticated and efficient as its working parts and a whole new market of serious applications would open up.

In other words, package BBC Micro systems in smart custom designed housings that gave the machines an attractive new image in the eyes of potential customers.

The idea has proved a tremendous success. Orders for Oak systems are increasing at the rate of 50 per cent a month for packages ranging in price from £200 to £2,000.

Whitehall ministries, educational establishments, multinational companies, local government authorities and medical institutions have bought Oak systems.

Medicine, science, mechanics, accountancy and retailing are being serviced by bespoke systems incorporating specific software for vertical markets.

Remarkably, the Oak success story has been achieved by Ann and David Atkins in the humble surroundings of their Bradford home and without the backing of City financiers.

TAKE A TEST FROM THE RANGE

CUMANA
0
CUMANA 0
CUMANA 0
CUMANA 1
THE MARK OF SAFETY

BE SAFE NOT SORRY

Cumana's CS range of single disk drives have been subjected to the strict safety demands of the BEAB.
They have now been awarded BS415 approval, so if you value safety do not trust it to anything less than Cumana.
Cumana's dual range of disk drives have also been submitted for approval.

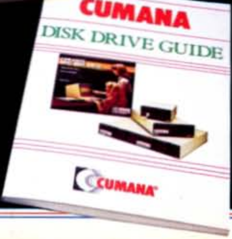
So now you have got your home computer, you're ready to talk to Cumana – the best name in memory. Already a market leader throughout Europe for their range of disk drives, Cumana now have other products on offer, all to the same exacting standards that have made their disk drives the number one choice in the home and in education.

The Touch Pad

The Touch Pad is a low-cost graphic plotting aid for the BBC micro. This compact display cursor moving device simplifies programming with the touch of the stylus.

The product comes complete with an instruction booklet, basic software, stylus and connecting cable. Its uses are in graphics, computer aided design, education and games.

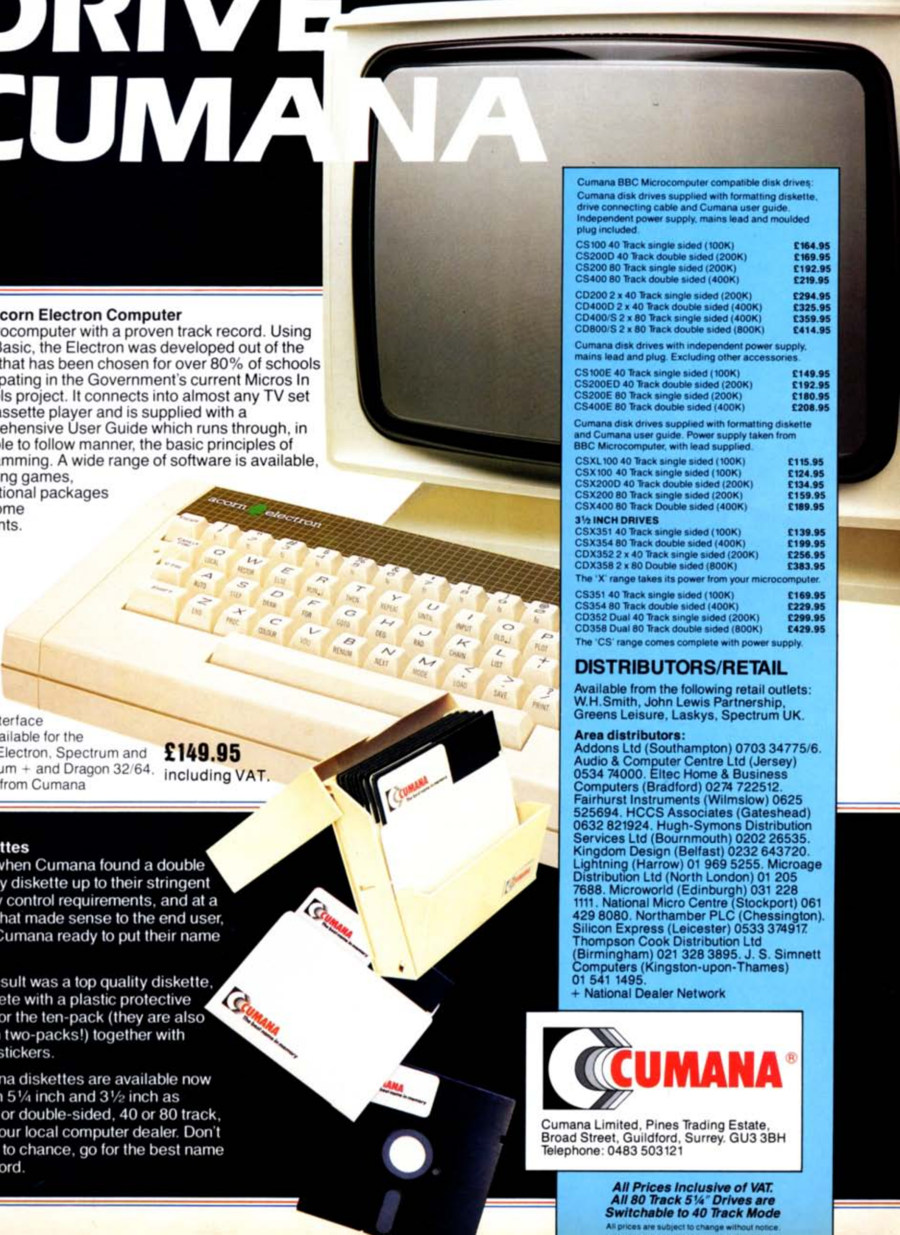
£69.95
including VAT.



Disk Drives

Cumana have spent years on research, development and marketing a range of drives second to none. Their drives are compatible with BBC, Spectrum, Dragon, Oric, Tandy Models III and 4 and Video Genie. They are fully guaranteed for 12 months and approved for electrical safety by the D.M.E.E. and are extensively used in GLC and ILEA establishments. Cumana were the first independent disk drive supplier and are now Europe's market leader. Their products have been proven in the schools, universities and homes throughout Europe. Let us drive you in the right direction, send now for further details of the Cumana range, or see them at our distributors and at selected branches of W.H. Smith, Lasky's, Greens, Currys, and Spectrum UK.

DRIVE CUMANA



The Acorn Electron Computer
A microcomputer with a proven track record. Using BBC Basic, the Electron was developed out of the Micro that has been chosen for over 80% of schools participating in the Government's current Micros In Schools project. It connects into almost any TV set and cassette player and is supplied with a comprehensive User Guide which runs through, in a simple to follow manner, the basic principles of programming. A wide range of software is available, including games, educational packages and home accounts.

Disk interface now available for the Acorn Electron, Spectrum and Spectrum + and Dragon 32/64, details from Cumana

£149.95 including VAT.

Diskettes
Only when Cumana found a double density diskette up to their stringent quality control requirements, and at a price that made sense to the end user, were Cumana ready to put their name to it.

The result was a top quality diskette, complete with a plastic protective case for the ten-pack (they are also sold in two-packs!) together with index stickers.

Cumana diskettes are available now in both 5¼ inch and 3½ inch as single or double-sided, 40 or 80 track, from your local computer dealer. Don't trust it to chance, go for the best name on record.

Cumana BBC Microcomputer compatible disk drives:

Cumana disk drives supplied with formatting diskette, drive connecting cable and Cumana user guide. Independent power supply, mains lead and moulded plug included.

CS100 40 Track single sided (100K)	£164.95
CS200D 40 Track double sided (200K)	£169.95
CS200 80 Track single sided (200K)	£192.95
CS400 80 Track double sided (400K)	£219.95
CD200 2 x 40 Track single sided (200K)	£294.95
CD400D 2 x 40 Track double sided (400K)	£325.95
CD400/S 2 x 80 Track single sided (400K)	£359.95
CD800/S 2 x 80 Track double sided (800K)	£414.95

Cumana disk drives with independent power supply, mains lead and plug. Excluding other accessories.

CS100E 40 Track single sided (100K)	£149.95
CS200ED 40 Track double sided (200K)	£192.95
CS200E 80 Track single sided (200K)	£180.95
CS400E 80 Track double sided (400K)	£208.95

Cumana disk drives supplied with formatting diskette and Cumana user guide. Power supply taken from BBC Microcomputer, with lead supplied.

CSXL100 40 Track single sided (100K)	£115.95
CSX100 40 Track single sided (100K)	£124.95
CSX200D 40 Track double sided (200K)	£134.95
CSX200 80 Track single sided (200K)	£159.95
CSX400 80 Track Double sided (400K)	£189.95
3½ INCH DRIVES	
CSX351 40 Track single sided (100K)	£139.95
CSX354 80 Track double sided (400K)	£199.95
CDX352 2 x 40 Track single sided (200K)	£256.95
CDX358 2 x 80 Double sided (800K)	£383.95

The 'X' range takes its power from your microcomputer.

CS351 40 Track single sided (100K)	£169.95
CS354 80 Track double sided (400K)	£229.95
CD352 Dual 40 Track single sided (200K)	£299.95
CD358 Dual 80 Track double sided (800K)	£429.95

The 'CS' range comes complete with power supply.

DISTRIBUTORS/RETAIL

Available from the following retail outlets: W.H.Smith, John Lewis Partnership, Greens Leisure, Laskys, Spectrum UK.

Area distributors:
Addons Ltd (Southampton) 0703 34775/6. Audio & Computer Centre Ltd (Jersey) 0534 74000. Eltec Home & Business Computers (Bradford) 0274 722512. Fairhurst Instruments (Wilmslow) 0625 525694. HCCS Associates (Gateshead) 0632 821924. Hugh-Symons Distribution Services Ltd (Bournmouth) 0202 26535. Kingdom Design (Belfast) 0232 643720. Lightning (Harrow) 01 969 5255. Microage Distribution Ltd (North London) 01 205 7688. Microworld (Edinburgh) 031 228 1111. National Micro Centre (Stockport) 061 429 8080. Northamber PLC (Chessington). Silicon Express (Leicester) 0533 374917. Thompson Cook Distribution Ltd (Birmingham) 021 328 3895. J. S. Simnett Computers (Kingston-upon-Thames) 01 541 1495.
+ National Dealer Network

CUMANA®

Cumana Limited, Pines Trading Estate,
Broad Street, Guildford, Surrey. GU3 3BH
Telephone: 0483 503121

All Prices Inclusive of VAT.
All 80 Track 5¼" Drives are Switchable to 40 Track Mode

All prices are subject to change without notice.

KEMPSTON
MICRO ELECTRONICS LTD

...Let your BBC play the game...

KEMPSTON BBC PRO JOYSTICK

This new joystick has been designed to complement the BBC Computer in both style and performance.

Based on the best selling Competition Pro 5000 series, the BBC Pro Joystick contains micro switches allowing movement in a total of eight directions together with twin fire buttons for left and right handed play.

The joystick is moulded in cream and brown and plugs directly into the analogue port ensuring compatibility with a wide range of existing BBC software without the need for expensive interfaces.

ALSO AVAILABLE PRINTER CABLE

Available directly from Kempston Micro Electronics Ltd · Singer Way · Woburn Road Industrial Estate · Kempston · MK42 7AF · Tel (0234) 856633 · Telex 826078 KEMPMI G · Please send me:-

BBC Pro Joystick .... £17.95 ☐ Printer Cable .... £13.50 ☐

Access/B.Card ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

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Overseas add £4.00 P&P

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APRIL '85

TECHNOMATIC

BBC Computer & Econet Referral Centre

17 Burnley Road, London NW10 1ED Tel: 01-208 1177
305 Edgware Road, London W2 Tel: 01-723 0233

Please add carriage: (a) £8; (b) £2.50; (c) £1.50; (d) £1 and 15% VAT to order value

ACORN COMPUTER SYSTEMS

BBC Model B	£300(a)
BBC Model B + DFS	£346(a)
BBC Model B + Econet	£335(a)
BBC Model B + Econet + DFS	£399(a)
ACORN 10Mbyte Hard Disc	£1300(a)
BBC Dust Cover	£4(d)
BBC Carrying Case	£12.50(b)

UPGRADE KITS

A to B	£65 (d)	Installation	£20
ACORN DFS Kit	£95 (d)	Installation	£15
Econet Kit	£55 (d)	Installation	£25
Speech Kit	£47 (d)	Installation	£15
BASIC II Rom with user guide			£22.50
1.2 O/S Rom	£7.50	DNFS Rom	£17.50
4816AP Memory upgrade RAM (each)			£2.00

ECONET ACCESSORIES

Terminator (Two reqd per installation)	£31 (c)
Clock with psu	£39 (c)
Printer Server Rom	£41 (c)
File Server Level I	£86 (c)
File Server Level II	£216(c)
File Server Level III	£300(c)
10 Station Lead Set	£25 (c)
Extra Econet cable	£1.50/m (d)
Econet User Guide	£10 (d)

ACORN BITSTICK

The renowned 'BITSTICK' graphic CAD package. Using the on-screen menu and colour pallette, it can draw freehand as well as lines and shapes with great accuracy. Any part of a drawing may be magnified many times, and up to 48 drawings may be saved on a disc. In total, a friendly yet sophisticated CAD system offering tremendous value. £325(a)

FX80 dump routine available. £35

Multi-Plotter Driver (Plotters include H.P., Epson HI-80, Watanabe, etc) £79(c)

ACORN Z80 2nd Processor

This processor converts your BBC into a complete business micro with all the computing power a professional would need. The system is CP/M based and is supplied with free software package. The package includes three office productivity programs, (memoplan, fileplan and graphplan), Systems generator program, three programming languages plus the ACCOUNTANT business program. Software is accompanied by extensive manuals that not only get you started but also answers your whys and hows. All for only £348 (a)

See our section on CP/M software for other packages available for use with this processor.

ACORN 6502 2nd Processor

This processor is designed for the serious computer user who wants to get even more out of his computer. This processor provides increased memory — allowing up to 44K for Basic programs and up to 60K for assembly language programs, regardless of screen mode in use. (ideal for VIEW). An increase in speed means that programs run up to 50% faster. The second processor/BBC combination offer computing power comparable to systems costing twice as much. £175 (a)

ACORN P-SYSTEM

NEW

The long-awaited-for portable operating system has arrived. Intended for use with the 6502 Second processor, this portable operating system is a complete implementation and comes complete with a Filer, Editor, and compilers for two languages, USCD PASCAL and FORTRAN-77. Widely used in universities and colleges, as well as being popular with business software authors, P-System is user-friendly, offering ease of program development as well as portability. £263(b)

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Weekdays: 18.30 to 09.30
Sunday: 24 hours

ACORN WINCHESTER DRIVES

Acorn Hard discs are now available in 10 Mbyte and 30 Mbyte versions. The drive plugs into the 1 MHz bus. The ADFS filing system with its hierarchial filing structure provides an excellent file management facilities. Data is transferred at a rate of 1 Mbit/sec and the 'seek time' is 85 ms. Full details on request.

10 Mbyte Winchester Drive £1300(a)
30 Mbyte Winchester Drive £1999(a)

Acorn File Server Level 3: This enhanced file server allows more users on the network with better user access. £300(b)
If purchased with a Winchester Drive £200(b)

TORCH UNICORN PRODUCTS

The TORCH Unicorn system has been in the field for over two years and is now a proven Z80 system for the BBC. It gives you the potential to expand which no other system can currently offer. You can expand a single system with a 20Mb Hard Disc, have the processing power of a 32bit 68000 cpu with up to 1Mbyte of RAM and a Single/Multi-user UNIX operating System or set up a network. All these capabilities are available now. Probably the most popular upgrade is the TORCH Z80 PACK, offering an attractive 2 × 400K disc drive, a Z80 second processor with 64K RAM, and a CP/M compatible operating system. A free bonus is the easy-to-use, yet advanced PERFECT range of software including a word-processor, speller, spreadsheet and database. Z80 BBC BASIC is also included. £650(a)

TORCH GRADUATE SYSTEM

The ultimate upgrade — converts your BBC into a powerful 16 Bit business computer and makes it disc and hardware compatible with the IBM PC. With 256K RAM and single/dual drives, it simply connects through the 1MHz bus. (The disc drives can be used in both BBC and IBM mode, without requiring a disc interface.) The top-of-the-range Model G800/2 comes complete with the free Xchange range of software, and includes a full-feature word processor, a financial planner, a database and a business graphics package — all 'linkable'.

(This highly acclaimed software is now available for the IBM PC at a cost of over £400!)

G800/2: £945(a)

Z80 Card ZEP100 with PERFECT Software Packages + Z80 Basic	£275 (a)
Z80 Disc Pack ZDP240 with software as above	£650 (a)
20Mb Hard Disc + 1 × 400K Floppy Drive	£1,950 (a)
Unicorn 68000, Unix OS/Z80B/512K, 20MB Hard Disc, 400K Floppy	£3495 (a)

PRINTERS

ALL PRINTERS HAVE A 12 MONTH GUARANTEE

DOT MATRIX

KAGA TAXAN:

* Epson Compatible Control codes * 80 or 156 Column
* NEAR LETTER QUALITY Print using 23 × 18 matrix
* Text Modes include Normal, Italic, Enlarged, Condensed, Super/Sub Script, Proportional
* Dot Addressable graphics in various modes
* 3K buffer which can also hold user defined characters
* Extra ROM/RAM socket for custom print fonts
* Friction & Tractor feed with built in paper roll holder

KP810 (80 column) £255 (a)
KP910 (156 column) £359 (a)

EPSON:

The industry standard printer offering the quality, reliability and versatility.

RX80T £215 (a) RX80FT £225 (a)
RX100 £345 (a) FX80 £315 (a) FX100 £435 (a)

DAISY WHEEL

BROTHER HR15: • 14 cps • 3K Buffer • Two colour printing • Proportional spacing * Underline * * Bold * Shadow print * Super/Sub script + many other features.

BROTHER HR15 £325(a)

• 15 cps • 2K Buffer • Switchable 10/12/15 cpi • Proportional printing • Linear Motor for max reliability.

JUKI 6100 £325(a)

ACORN VIEW PRINTER DRIVER GENERATOR

As well as coming with pre-defined drivers for printers including EPSON FX80, JUKI6100 etc, this generator enables you, by answering a few simple questions, to generate your own dedicated driver for almost any printer. The days of having to buv individual dedicated printer drivers are gone! £10(d)

EPSON HI-80 PLOTTER

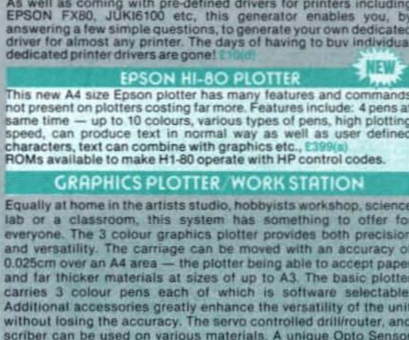
NEW

This new A4 size Epson plotter has many features and commands not present on plotters costing far more. Features include: 4 pens at same time — up to 10 colours, various types of pens, high plotting speed, can produce text in normal way as well as user defined characters, text can combine with graphics etc., £399(a)
ROMs available to make H1-80 operate with HP control codes.

GRAPHICS PLOTTER/WORK STATION

Equally at home in the artists studio, hobbyists workshop, science lab or a classroom, this system has something to offer for everyone. The 3 colour graphics plotter provides both precision and versatility. The carriage can be moved with an accuracy of 0.025cm over an A4 area — the plotter being able to accept paper and far thicker materials at sizes of up to A3. The basic plotter carries 3 colour pens each of which is software selectable. Additional accessories greatly enhance the versatility of the unit without losing the accuracy. The servo controlled drill/router, and scriber can be used on various materials. A unique Opto Sensor (using a Hewlett Packard device) turns the plotter into a high-res scanning digitiser to read & store whole diagrams and photographs. Workstation comes complete all accessories.

Workstation Complete £490(a)



Basic Plotter £270(a)
Opto Sensor £72(c) Drill/Router Attachment £79(c)
Power Supply: PS12V £42(c) PS24V £79(c)
Scandump Utility Disc £14.95 (d)

TECHNOMATIC

All prices exclude VAT

PRINTER ACCESSORIES

EPSON:

NEW

32K Internal Buffer Parallel [illegible]
Paper Roll Holder [illegible] FX80 Tractor Attachment £37(c)
Interfaces: 8143 RS232 [illegible] 8148 RS232 + 2K £57(c)
8132 Apple II [illegible] 8165 IEEE + Cable [illegible]
Serial & Parallel Interfaces with larger buffers available.
Ribbons: RX/FX/MX80 £5.00(d) RX/FX/MX 100 £10(d)
FX80 Dustcover £4.50(d)

KAGA TAXAN: RS 232 Interface + 2K buffer £79(c); Ribbon KP810/910 £8(d)

JUKI: RS232 Interface [illegible] Spare Daisy Wheel £14(d) Ribbon £2.50(d)
Sheet Feeder [illegible] Tractor Feed Attach [illegible]

BROTHER HR15: Sheet Feeder [illegible] **Ribbons Carbon or Nylon** £4.50(a)

BBC Printer Lead: Parallel (42") £7(d) Serial £7(d)
Printer Leads can be supplied to any other length.

Plain Fanfold Paper with extra fine perforation (Clean Edge):
2000 sheets 9.5" × 11" £13(b) 2000 sheets 14.5" × 11" £18.50(b)
Labels per 1000s: Single Row 3½" × 1 7/16" £5.25(d)
Triple Row 2-7/16" × 1 7/16" £5.00(d)

PRINTER SHARER/BUFFER

A unique sharer/buffer that provides a simple solution to improve system utilisation. It can be connected to up to three computers and it will automatically switch between the computers to scan for data — no manual switching required. High speed data input rate to the buffer cuts down the normal waiting time for the computers for the printing operation to complete and thus allowing the computers to be used for other uses. In networked systems it can eliminate the printer server unit. The 64K buffer would hold over 30 A4 pages of text.

Facilities include: COPY, PAUSE AND RESET. LED indication for percentage of memory available and data source. Mains powered. Send for detailed specification.

TSB 64 Buffer/Sharer £245(a)
Cable Set £30

PERIPHERAL & COMPUTER SHARERS

We now offer an extended range of peripheral sharers to allow the user to switch between computers, printers and modems. High quality switching mechanisms housed in fully shielded metal cases ensure reliability. No power required.

Three Computers to one centronics printer (all 36 lines switched) £65(b)
Four Computers to one centronics printer (all 36 lines switched) £79(b)
Three Computers to one serial printer/modem (all 25 lines switched) £59(b)
Four Computers to one serial printer/modem £69(b)
BBC Cable Sets 3 way £22(c) 4 way £27.50(c)

Computer Sharer:
Allows one computer to be connected to two parallel printers fitted with cable for the BBC computer £19.50(b).

GRAFPAD

A low cost graphic tablet offering the performance & durability required by industrial and educational users. It is compact, accurate & reliable; working area 240 × 192mm + menu area. Comes complete with a CAD package. £110(b).

01-208 1177

Please add carriage: (a) £8; (b) £2.50; (c) £1.50; (d) £1
and VAT at 15% to order. Carriage (a) sent by Datapost

MONITORS

All monitors supplied with BBC lead

MICROVITEC

All 14" monitors now available in plastic or metal cases, please specify your requirement.

14" RGB		with PAL & Audio	
1431 Std Res	£165(a)	1431 AP Std Res	£210(a)
1451 Med Res	£240(a)	1451 AP Med Res	£280(a)
1441 Hi Res	£399(a)	These monitors can receive TV programs thru a Video Recorder	

20" RGB with PAL & Audio

2030CS Std Res	£380(a)	2040CS Hi Res	£685(a)

KAGA TAXAN 12" RGB

VISION II Hi Res £235(a) VISION III Super Hi Res £340(a)

SANYO CD3125NB 14" RGB Std Res £179(a)

MONOCHROME MONITORS:

SANYO DM8112CX Hi Res 12" Green Screen	£90(a)
KAGA KX1201G Hi Res 12" Etched Green Screen	£99(a)
KAGA KX1202A Hi Res 12" Etched Amber Screen	£105(a)
ZENITH 123 Hi Res 12" Green Screen	£68(a)
ZENITH 122 Hi Res 12" Amber Screen	£68(a)
Swivel Base for Kaga Monochrome fitted with Digital Clock	£21(c)
Monitor Plinth for the BBC	£13.50(b)
Double Tier Plinth for BBC and flat pack dual drive	£19.50(b)

BBC Leads Kaga RGB £5(d) Microvitec £3.50(d) Monochrome £3.50(d)

RB2 TRACKER BALL

Marconi with its years of experience making tracker balls for use in Military and Air Traffic Control have developed a quality device for the serious hobbyist, for educational uses, and for low cost CAD/CAM applications. RB2 is a compact, ergonomically designed tracker ball that provides precise positional control and rapid direction changing using a freely rotating resin ball in any direction without the limiting stops or the zero point drift of joystick controls. Three switch buttons enable easy software manipulation to incporate the use of the tracker ball. Appropriate software will enable the RB2 to take over the functions of cursor keys in word processing, CAD/CAM applications and two dimensional positional controls of robots, drillheads etc. RB2 which plugs into the user port is supplied with utility programme to use it as a joystick with other software, a comprehensive graphics/CAD program and a program demonstrating its editing capabilities: User guide includes instructions on writing your own programs for the RB2. £52(b)

AMX MOUSE – As seen on the BBC TV Micro progam

In conjunction with a controlling ROM this sophisticated mouse has many advanced features such as Icons, Windows etc., these can be used in ordinary programs as well as sophisticated CAD Design. The supplied 'AMX ART' is a superb, yet simple-to-use CAD package allowing the creation of amazing graphical designs. A screendump for drawings is included. It can also be used with Wordwise/View to replace the cursor keys. Supplied complete with CAD Package, ROM and full instruction manual. £75(b)

DISC DRIVES

TECHNOMATIC disc drives come fitted with high quality slimline Japanese mechanisms and represent the state of art in disc drive technology. They are built to highest standards and are all tested to their full performance capability before packaging. Single drives are offered with or without integral power supply whilst the dual drives are supplied with generously rated switch mode power supply. Attractively designed steel casings are painted in hard wearing BBC matching paint. All drives can operate in single and double density modes. Drives are supplied with cables, manual and formatting disc and are ready to be fitted to the computer.

Single Drives

1 × 100K 40T SS : TS55A £100(b); CS55A with psu £125(b)
1 × 200K 40/80TSS CS55E with psu £150(b)
1 × 200K 40TDS £115(a)
1 × 400K 40/80TDS : TS55F £125(a); CS55F with psu £169(b)

Dual Drives

2 × 100K 40T SS: TD55A with psu £250(a)
2 × 400K 40/80T DS: TD55M with psu £310(a)
2 × 400K 40/80T DS: TD55MP in flat pack with built-in plinth £325(a)

DISC DRIVE MULTIPLEXER

A simple device that enables up to four computers to be connected to one single or dual drive. Ideal unit for installing in classrooms where networking is not planned or necessary or the costs have to be kept low or where software information is shared. Several of these units can be installed in series to connect more computers to access the same discs. Units supplied with 5' of cable per outlet as standard. Mains powered.

TDM 4 Quad Unit (upto 4 computers) £135(a)
TDM 2 Dual Unit (2 computers) £75(b)

Note: All computers must be fitted with a DFS

3M FLOPPY DISCS

Authorised Distributor
Data Recording Products

3M

Industry standard high quality discs with guaranteed error free performance for life.

Discs in packs of 10:

40T SSDD **£15(c)**	40 T DSDD **£18(c)**
80 T SSDD **£22(c)**	80 T DSDD **£24(c)**

DISC ACCESSORIES

Single Disc Cable £6(d) Dual Disc Cable £8.50(d)
10 Disc Library Case £1.80(d) 30 Disc Case £6.00(c)
Lockable Storage Boxes 40 Discs £14(c) 100 Discs £19(c)

The FLOPPICLENE disc head cleaning kit is the ideal way to ensure the optimum performance of your drives. The use of disposable cleaning discs eliminate the risk of recontamination and abrasion of the sensitive disc heads and ensure continuously reliable data capture and transmission.

Floppiclene with 20 disposable cleaning discs. £14.50(b).

COMMUNICATIONS

MODEMS

ACORN PRESTEL: The official Acorn add-on — an advanced BT Approved. Auto-Dial, Prestel Terminal ideal for British Telecom Gold. Comprehensive software includes 'tagged' frames, downloading of Telesoftware, saving of frames, printing, sophisticated 'Mailbox' handling c/w editor. A built-in speaker allows line monitoring. A simple !BOOT file allows automatic operation £99(b)

BUZZ BOX A full spec, BT approved, pocket size, direct connect modem with both originate & answer modes, full & half duplex, allowing access to many databases, bulletin-boards as well as intercomputer communications. It conforms to CCITT V21 300/300 Baud Standard. Battery/mains powered £52(c) BBC Lead £6 External PSU £9(c)

MINOR MIRACLES WS2000 A world standard modem, having BT approval, covering V21,V23,BELL 103/113/108 and including 75,300,600,1200 Baud ratings. (It even includes 'reverse Prestel'!). This is the modem that will cover 'Prestel' type systems as well as Bulletin Boards both in the UK and abroad. What possibly gives this modem its biggest advantage is its option of computer control. A 25Way RS232 input as well as possible computer controlled auto-dial/auto-answer makes this modem unique. WS2000 £129(c) BBC Serial Cable £7

WS2000 Auto-Dial card: includes an integral loudspeaker for monitoring of the phone line £30(d).

BBC User Port cable (for modem control) £7.

SKI KIT (Allowing total control of the modem by your computer) £10.

DS1 Disc (for Commstar): When used with the Auto-dial card, SK1 Kit, and a user port cable, this software will dial out to Prestel, enter your password etc. and leave you in Commstar. Will also store many bulletin board telephone numbers for autodialling £10.

WS2000 Auto-Answer Card £30(d).

(Please note that the A/D & A/A Cards are still awaiting BABT Approval.)

UNICOM A High Performance, yet low-cost Modem. Features include: Auto-dial & auto-answer, Auto baud rate scan, 75,300,1200 Baud rates with V21, V23 and Bell standards. Sophisticated software in ROM allow many features like: Auto-Dial. Redial, Remote facilities etc. An Auto-Dial disc allows storage of commonly dialled numbers. UNICOM £49.95(b) Unicom ROM £20 Unicom Disc £9.95 Unicom Cable £6(d) Not BT approved

TELEMOD-2 A BT approved modem complying with CCITT V23 1200/75 Duplex & 1200/1200 Half-Duplex standard, that allows communication with Viewdata services e.g. Prestel, Micronet etc., as well as using 1200 Baud for communicating with other computer users. Mains powered. TELEMOD 2 £65(b) BBC Lead £7.00

COMMSTAR An ideal communications Rom. Extremely easy to use, yet very versatile. It features both a Prestel mode as well as a Terminal mode, thus offering very good value for money. In Prestel mode, all normal Prestel features are available including, downloading of software, saving and retrieving of pages on disc, page tag, revealing of hidden text etc. Its terminal mode is ideal for bulletin boards etc. All input may be copied into a buffer in memory over which full control is available. Controls of protocols are very simple and any type of file, (not just ASCII) may be sent using XModem protocols. Even includes an elapsed time-clock. £29(d)

TERMI-II A good all round package for communicating with notice boards, electronic mail services etc. Termi is a semi-intelligent terminal emulator allowing the BBC to act as a dumb terminal, slave BBC graphics terminal, or VT52 terminal. The rates at which data is sent or received is easily set up with rates of up to 4800 Baud with 40/80 col. selectable. Allows files to be transmitted from disc, or a copy of incoming data to be sent to a file or to a printer. (Termi is not suitable for PRESTEL). £28(d)

COMMUNICATOR This is a full 80 col VT100 terminal emulation program on 16K eprom. It is a more advanced program than TERMI and features easy to follow screen menus. The rate at which data is sent or received is easily set up with rates up to 19200 Baud with 80 column text. Allows files to be transmitted from disc, or a copy of incoming data to be sent to a file or to a printer. (Communicator is not suitable for PRESTEL). £59(d).

TECHNOMATIC

All prices exclude VAT

EPROMER II

This enhanced eprom programmer will handle the full range of popular single rail eproms. Its sophisticated menu driven software makes the programming of eproms simple and efficient. Features included in this programmer are normally found in industrial grade programmers costing many times more.

- Interfaces with the BBC through 1 Mhz bus. Fully buffered and complies with the ACORN protocols. Integral power supply ensures no power drain from the computer.
- All eproms up to 16K programmable in single pass.
- User friendly software driven menu provides total control from the keyboard — no knobs to fiddle with.
- Selectable programming voltage — 25/21/12.5V.
- Defaults to normal programming — high speed algorithmic programming selectable.
- READ/BLANK CHECK/PROGRAM/VERIFY at any address or addresses.
- Constant display of all options selected.
- Full screen editor with HEX/ASCII input — Full TAPE/DISC filing facility.
- Data entry from the keyboard, disc/tape or another eprom.
- Several BBC BASIC programs can be entered on one eprom.

EPROMER II with manual & cassette £99(b) Software on: Disc £3 ROM Based software £12.50 extra

UV ERASERS

UVT1T Eraser with built-in timer and mains indicator. Built-in safety interlock to avoid accidental exposure to the harmful UV rays. It can handle up to 5 eproms at a time with an average erasing time of about 20 mins. £59(b).

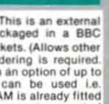
UV1T as above but without the timer. £47(b).

For Industrial Users, we offer UV140 and UV141 erasers with handling capacity of 14 eproms. UV141 has a built in timer. Both offer full built in safety features UV140 £61; UV141 £79(b).

SMARTMOUTH

The original 'Infinite Speech' Synthesiser — Still the best around!! A ready built, self contained speech synthesiser unit, attractively packaged with built in speaker. Tailored frequency response audio stages for optimum sound quality. Any word can be easily created — very economical with memory. Plugs into the user port — no roms required. Demo and development programs supplied on cassette (easily transferred to disc) £31(c)

'TIME-WARP' REAL-TIME CLOCK CALENDER



We have broken the price barrier! A low cost unit, allowing the facilities of units costing far more. Built to professional standards, it opens up the total spectrum of Real-Time applications. Possibilities include desk diary/planner, calender, continuous display of on-screen time and date information, automatic document dating, precise timing and control in scientific applications — its uses are endless. Simply plugs into the user port — battery backup is supplied as standard. A full manual as well as Extensive software on cassette (easily transferred to disc) — no ROMs needed. £29(c)

RAMROM-15

The advanced sideways ROM/RAM expansion system. This is an external unit, using high quality construction, attractively packaged in a BBC coloured metal case, allowing easy access to all the sockets. (Allows other units to be fitted inside the BBC). Absolutely no soldering is required. Allows 11/12 additional sideways ROMs to be fitted with an option of up to 16K sideways RAM. All commonly available RAM can be used i.e. 4801/6116/6264 or xx128. All the hardware to take the RAM is already fitted e.g. battery backup. For development work and further expansion, most of the 6502 processor signals are available. Supplied with utility disc and full instruction manual. £112(b)

01-208 1177

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ATPL SIDEWISE ROM EXPANSION BOARD

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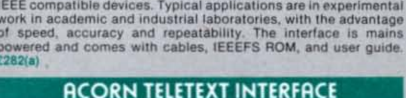

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BCPL STAND ALONE GENERATOR Utilities in this package enable the programs developed using the BCPL rom to be converted so that they can be run on any BBC micro whether it has a BCPL rom or not. Stand alone programs for other 6502 based systems can also be developed. £43(d)

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BILLBOARD A useful program that enables your BBC to produce super-large 'Billboard' type characters i.e. a continuous horizontal scrolling of super-large characters. Supplied in ROM. £16.50(d).

HELP Rom based comprehensive on screen HELP facility to aid and speed up programming. £21(d)

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DESIGN Design is a second processor which allows information to be displayed in a format suitable for demonstrations, slide projections, handouts or presentations. Graphs, Pie Charts & Bar Charts are quickly produced; automatically drawn & scaled. Versatile labelling facility, 25 User defined, 4 large macro characters plus screen dump facilities included. £16.50(d) Disc (80 or 40 Track).

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Painting by numbers

Number Painter
BBC B
ACORN ELECTRON
MENTAL ARITHMETIC
AGES 5-14

I LOADED **Number Painter** from ASK Software and let my two boys, aged 10 and 12, play with it – they were still playing it two hours later at bedtime.

Then my daughter, 17, and her boyfriend took over and I did not get a chance to play until the next day, and even then I had to get in quick before the boys came home from school. I give it thumbs up for interest and playability.

This is a girders and ladders program, another new twist to an old theme. The painter, who is beautifully animated, has to collect numbers to match a target figure using familiar keys or joystick.

Each number has a +, –, ×, ÷ sign and it gradually gets more difficult through 12 different levels. Success is rewarded with more difficult brain teasers and vice-versa.

The little man has four incarnations called Mr Plod, Mr Walker, Mr Speedy and Mr Swift. You choose the starting level and speed.

If the player tries to get a number which is too large – above 999 – or below zero, or if the painter falls through a hole in a girder, the game is frozen and there is time to work out the sum. However, once the man is moving, time is limited by a rising bucket that floods the screen with red paint when it reaches the top of its chain and the man is lost.

The age range is supposed to be from five to 14. A five year old would have great fun on level one, but even when I cheated on my calculator, I couldn't do level 12.

The instructions are in big, clear type and easy for an eight year old to read. The graphics and colour are very good.

Sound effects are used in a realistic way and they can be made louder or softer by a Ctrl-S command – very useful.

The one big fault with this program is that the authors have not disabled the Break key and if it is pressed the program is lost and has to be reloaded. This takes 2.4 minutes from tape.

A second section to this program is a self test which puts a series of sums on the screen at the level you choose and times the response.

Buy your child this game and he will gain a better understanding of numbers. But if you are a teacher, be prepared for each child to want the micro all day.

Alison Cernyw Hughes

Out on the battlefield

EVER fancied leading your own army into battle? There are people all over the country who indulge in such fantasies every weekend. They are wargamers, and their hobby covers everything from skirmishes to full campaigns, from several centuries BC to several centuries AD.

English Civil War by Red Shift, is another offering to bring wargaming to the BBC Micro. The battlefield is the screen divided into a grid – which can be viewed at any time – with varying amounts of inpenetrable wood scattered about.

Each side has units of pike, musket, artillery and cavalry, and a sconce or fort to defend. The various units have different fire power, movement and close quarter fighting abilities which each player has to use to defeat the other.

In reviewing this game I was looking for two things. Firstly, a game that is different from the usual run of Space Invaders/Pac-Man/Frogger/Donkey Kong types, and secondly, a genuine wargame on a micro.

RED SHIFT
English Civil War

It succeeds with the former, but as to the latter, I was somewhat disappointed. If it is meant to appeal to wargamers rather than computer games freaks then it will fall short of a lot of their demands.

The sound effects are distracting and inconsistent. The graphics quite acceptable, except the sconce, though I wish more colours could have been used.

The response times of the keys are somewhat annoying, and there is no reason why the same key has been used for moving and firing.

Also, it could have made playing easier the first few times if the values for ranges, close quarter combat and so on were in the instructions, rather than finding them out only during the game.

While playing the game, several incidents left me doubting the comprehensiveness of the program. The size of the battlefield limits manoeuvring. The composition of the armies is fixed, which most wargamers will not like.

Further – and I apologise if non-wargamers may not understand what I am getting at – the rules have several oversights. For example, musket units can fire at full effect while in hand-to-hand combat; attacking the side of a unit, particularly pike units, gives only a tiny advantage; units can back out of hand-to-hand combat without any problems; there is no morale system.

In the words of a nineteenth century French general: "C'est different, mais ce n'est pas le wargaming".

Roberta Wood

Chalksoft
RHYTHM and PITCH
Booklet

Pitched at right level

RHYTHM and Pitch, a suite of musical dictation tests, is rather unambitious in its scope, and certainly not the real breakthrough claimed by publishers Chalksoft.

But it undeniably has one major virtue which sets it apart from some of its competitors – it does what it sets out to do, and does it effectively.

In the refreshingly literate

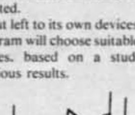
From Page 41

documentation, the author rightly claims that his brainchild is for music students of all ages. His prime aim, however, has been to supply teachers with graded aural exercises extending to about CSE level.

The dictation tests are presented in groups of 10. Answers are entered with the function keys or, for some low notes, the appropriate letter keys (the program comes complete with a key-card inlay). Scores are displayed and, in the disc version, stored in a file which can be called from the menu.

Within the constraints of three metronome settings, five note values, four major scales, 3/4 or 4/4 time, and a choice of rhythm only, pitch only, or rhythm and pitch combined, various levels of difficulty can be selected.

But left to its own devices, the program will choose suitable test grades, based on a student's previous results.



In the more advanced melody tests, the student is required to use pen and manuscript paper. This steam-age approach clashes with high technology, but the method is practical if only because it simulates current exam procedures.

For checking, the correct answer is displayed on the screen.

Nothing is more obviously suited to a micro than ear-training tests, an area in which the micro's often-vaunted patience and anonymity can for once be of unquestionable benefit.

Students can practice these most nerve-racking of trials without standing in the well of a piano, under the gaze of a teacher who, by causing anxiety, may unwittingly slow down or even reverse the learning process.

And the teacher can be freed from the time-consuming business of individual tuition.

I can therefore recommend Rhythm and Pitch as a functional educational aid, and a real labour-saving device.

Gabriel Jacobs

Has business potential – but examine with care

IN essence **Acornsoft's Business Software** series consists of two main systems – sales and purchases. There is also a mailing facility which makes use of customer and supplier data from both of these systems.

The series uses disc files and unless a large amount of disc swapping is to be endured a double drive is desirable.

The sales system consists of invoicing, order processing, stock control and accounts receivable modules. The purchasing system consists of accounts payable and purchasing modules.

The modules can be bought separately or those for each system may be linked together, either initially or subsequently, to extend the processing available.

The series is therefore ambitious but I think flawed in some areas and potential users would be well-advised to examine carefully what is on offer before deciding whether or not the series is suitable for their business.

They may find it does not do either at all or easily what they assumed it would do.

Mail
Syste
ORDE
PROCESS
-STOCK-
CONTROL

Consider the stock system. This is not updated or checked when the order processing system records that a despatch has been made – stock issues have to be specifically recorded, that is, effectively re-entered using the stock module.

The items purchased through the purchasing system do not in any way link with the items on the stock file.

As another example, invoices can only be produced if an order has been previously entered – even if the order processing module is not being used – but it is only possible to invoice for the whole order, not for part despatches.

Each module purchased has its own instruction booklet but about half of each is common to all. This is obviously so that each module can stand alone, but it does mean that if a number of modules are purchased it can be a little difficult to appreciate how they interact and a bit of a search to locate answers to problems.

The series has of course many good points. For example, unlike some accounts packages for home micros, the sales and purchases ledgers are kept on the open item system so that details of all outstanding transactions are maintained.

Users are forced to match cash receipts or payments against specific transactions. I also thought that the screen and printed output layouts were good.

This series has the potential of being very good but I think that some modification and rationalisation is needed before it could be thus described.

Ken Garrett

Terrorists can be unfair at times . . .

HAVE you ever wondered what it is like to patrol a street, just waiting for someone to shoot at you? That is the theme of **SAS Commander** from Comsoft.

SAS
COMMANDER
BBC MICRO MODEL B

Unlike Northern Ireland however, the terrorists can be distinguished by their uniform. Which is just as well, since approximately 20 per cent of the time they open fire from behind hostages and you must dodge the bullets and hold your fire until the hostage gets out of the way. Shooting a hostage by mistake will earn you an immediate dishonourable discharge.

The game consists of a series of street scenes. In Street 1 there is only one terrorist shooting at a time. In Street 2 there are two on stage at once and Street 3 has three working together.

What happens after Street 3 I don't know – I never survived that long without being hit the four times necessary to kill me.

It seems a little unfair that while the terrorist can angle his shots across the screen to hit you, you can only shoot vertically – this is what makes it so difficult when there are two or three terrorists in action.

There is nothing particularly outstanding about this game. However, its price – £4.95 on cassette for BBC or Electron – makes it better value than a lot of games on the market.

No doubt it will make an acceptable birthday present for many younger readers.

Michael Gilbert

6502 FOR THE BEGINNER

BBC Micro Utilities – a tape-based package – consists of a monitor and several example routines from a fairly good book on 6502 assembler programming on the BBC by Bruce Smith (Shira). This cassette is probably intended as an extra teaching guide to accompany it.

The package as a whole certainly does not come into the all-singing all-dancing bracket, although the initial loading screen did play a bar from Close Encounters with Lord Shiva kicking away out of time in the background.

A major problem with Beemon – the monitor utility – is it is written in Basic, and as such occupies a large chunk of memory which may be needed for other purposes such as your own machine code program.

Still, it features a disassembler, memory modifier, single-stepper, dump routine, memory move and fill routine, and a cassette interface which is primarily a method of loading and saving your machine code programs.

The monitor runs in Mode 7 only, and is wholly menu-driven.

Most of the features functioned adequately, though not to a level which I would have thought necessary to be a proper training tool. For example, the stepper is not capable of displaying the instructions as it steps along a piece of code.

Also any errors in your machine code program will usually mean that you will have to come out of Beemon, load and correct your program, assemble it again, save the binary code to tape, and then reload Beemon for another try.

Even worse, the instructions do not give any guide to the addresses where you may load your machine without corrupting Beemon itself.

The rest of the tape is padded out with example routines, such as word and multibyte addition and subtraction, hex and binary conversions, usage of some simple key input routines and so on. Nothing dramatic here except that they may save some typing for people following Bruce's book.

BBC MicroUtilities
Bruce Smith
strings
Shiva Software

In conclusion, this package is strictly low-cost beginner's application stuff and it is adequate in that respect. People wishing to take up 6502 programming further will still need to get a proper ROM-based monitor eventually.

Chris Chan

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Flights through time

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For several years **Space Pilot** has been one of my own particular favourite arcade games. I was therefore overjoyed to find Superior Software's version bore an uncanny resemblance to the original.

The game begins in 1916, the enemy being squadrons of biplanes. As your ship is technically superior you have little difficulty in wreaking havoc with these antique aircraft. Their only form of attack is to lob bombs at you from the cockpit.

Having limbered up on the first four squadrons, an airship plus escorts appears. Destroy this and you collect a 2000 point bonus and are transported to the next level.

Our next stop is 1940 when we engage battle with squadrons of Spitfires. These prove to be a little more taxing as they can fire back.

They are also accompanied by the occasional larger plane which fires a constant stream of bullets in all directions. These appear if you dawdle around waiting for parachutists to drift down through the screen.

Flying through a parachute is worth 1000 points so these are often worth the risk involved.

Screen three takes place in 1970, when your new opponents are helicopters. You may not rate helicopters as being much of an adversary – and you would be correct – but you try knocking out the damn homing missiles they keep firing in your direction!

The next year, 1980, begins to sort the men from the boys. The jet fighters are fast and they also have no regard for the taxpayers' money as they squander homing missiles two at a time.

I would have loved to have told you all about the UFOs on screen five but due to circumstances beyond my control there always seemed to be one missile too many heading in my direction. Must be my magnetic personality.

Space Pilot is an excellent game for both beginner and hotshot. It begins nice and steady but once you reach the higher levels just watch those bad guys move.

Jon Revis

Runabout database

COMPARED with the expensive Rolls Royce BBC databases, **Bel Base** is no more than a family run-about.

But then there's a difference between paying almost a third of the price of your machine for one piece of software, and a mere £18 for the disc version of Bel Base, which may well do all you want it to. The £49 will buy the ROM version, and if you can envisage a good use for a database on cassette, it will cost you £16.

As an automated card index, the package should satisfy basic home or club requirements. Creation of a file, addition and deletion of data or whole records, and simple searching and retrieval can all be carried out relatively smoothly. Sort speed is about average for a program in this price bracket.

Bel Base does lack some features which many users are rightly beginning to expect as the norm. There's little scope for tailoring, no and/or operators, no file restructure option, no date field and sorting is on one key only.

On the other hand, some touches are quite unusual. A neat macro substitution allows automatic entry of repeated data. A global editing – search and replace – function is handy, though it has obvious dangers for the slaphappy user.

Mailshot – which comes with Bel Base but can also be bought separately – is not as impressive as its name suggests. It is little more than a label-generator, but it has a certain flexibility lacking in the report capabilities of some other databases for the BBC

A companion program – Bel Graph (£17) – will produce bar graphs and pie charts from raw data in a Bel Base file. But that's as far as integration goes – there is no option in Bel Base for creating a spool file, let alone a direct link to a word processor.

The documentation is comprehensive, though the Jabberwocky flavour is a bit strong for the uninitiated and its level of literacy would certainly not have satisfied Lewis Carroll!

Bel Base is simple, and the disc-base version is cheap. On these grounds alone it's worth considering. But it's unlikely to toll the death knell for its competitors, even those in its price range.

Katherine Cranford

Enigmatic workshop is fun

I HAVE been using **Workshop** by Acornsoft for some while now and I still don't have the faintest idea who it is aimed at.

I am convinced that it does its job perfectly, but there again it doesn't seem to have any pre-defined function. If all this sounds confusing, then it is a good reflection on this disc which is fascinating and great fun with little real purpose!

The scenario is a workshop with a choice of three shapes to work with – square, circle or triangle. A number of machines are available which can rotate, cut, stretch, paint the shape as it undergoes a strange metamorphosis before your very eyes.

The shape is first selected from the shelf page and then moved to the plan stage. Here the shape lies surrounded by the various symbols which represent the various machines available.

These can be selected by use of the function keys as shown on the function strip which accompanies the program.

The drill bores a hole in the shape, placing a hole in the centre of the box. The shape has already been moved around in the box while on the plan page, and so the hole might not be central. A larger hole is made by subsequent presses of Return.

Painting is fairly obvious, with the colours all available except black. A rather interesting effect results from the NOT function, which changes the shape under consideration from the shape itself to the mould around it. Shapes can be enlarged or reduced by the arrow keys and the squash machine.

ACORNSOFT HOME EDUCATION
Workshop
For the BBC Microcomputer

Perhaps one interesting way to get to grips with the program is in the form of a game. It is possible to use the look feature to show the steps of evolution which the shape went through.

If one child were to play around with a shape and machines in any way so wished, then a really challenging problem would be to recreate the original shape from scratch. It then becomes an absolutely fascinating pursuit.

As I said at the beginning, there is no specific purpose resulting from this program but it is enormous fun all the same.

Phil Tayler

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Don't run the risk of damaging your ROMS/EPROMS or your BBC Micro. Whenever you want to remove ROMS/EPROMS from your BBC, why not fit our Low Profile ROM Module System and save your collection of ROMS/EPROMS in our specially designed cartridges. The CARE LOW PROFILE MODULE SYSTEM does not take any power from your BBC Micro and allows you unlimited ROMS/EPROMS.

The CARE LOW PROFILE ROM MODULE SYSTEM gives you the flexibility to plug in any ROM/EPROM, for example – Disc Doctor – Toolkit – Wordwise etc – without having to re-open your BBC Micro every time you want to change your ROM/EPROM.

The CARE LOW PROFILE ROM MODULE SYSTEM is a ribbon extension cable through the predestined slot on the left of the BBC keyboard, fitting into one of the existing sideways ROM sockets. Once you have fitted the module system, you need one CARE ROM CARTRIDGE for every ROM/EPROM.

The CARE LOW PROFILE ROM MODULE SYSTEM has been designed to fit all BBC Micros Model B. It will also fit BBC Micros Model A which have been upgraded to enable access through predestined slot to sideways ROM sockets.

Each CARE LOW PROFILE ROM MODULE SYSTEM comes neatly packaged in a special presentation case.

EACH SYSTEM CONTAINS:

1 Low profile socket housing.
1 Cable assembly.
1 Rom cartridge.
5 Blank labels.
1 Fitting instructions.

COMPLETE SYSTEM	@ £16.10d inc. VAT
Spare Cartridge	@ £4.14c inc. VAT
5 Cartridges	@ £19.55c inv. VAT
10 Cartridges	@ £33.58c inc. VAT
6 way library rack	@ £1.84c inc. VAT

The CARE Low Profile system is totally compatible with the VIGLEN system

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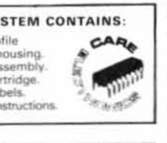

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a) @ 8.00 c) @ 1.00
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Trying to get back into the black?

IN the red? Bank manager sending nasty letters? **Making Ends Meet** may help you get into the black again.

It is an educational simulation where the user is placed in the position of a young school leaver about to face the problems of personal budgeting.

It is intended to be used more as a stimulus for class discussion than as an individual learning device so would be a useful teaching aid for social studies and personal development lessons for 15-16 year olds. However it could also be used for a wider range of age groups and subjects.

The excellent screen layout and prompts make the equally excellent written instructions superfluous. After initial inputs giving details of sex, accommodation, transport and so on, the user is led through a number of situations where decisions have to be made with respect to spending and saving each week.

The program entices the user with frivolous ways of parting with money as well as a number of forced expenses of the type which could be expected in real life, such as road tax, new shoes and repairs.

Saving for holidays and entertainment costs are all part of this well thought out program from Cambridge Micro Software.

At the end of the week the user has the dubious pleasure of seeing the micro spend his money and display the weekly balance, thus giving credence to Micawber's anecdote for happiness or misery.

The micro is the ideal educational tool for this type of interactive modelling since this sort of simulation is far too complex to be carried out using blackboard and chalk.

The booklet which comes with the tape emphasises the need for careful lesson planning and gives advice on how to use the program along with minimum wages required for different situations and a sample worksheet.

Another plus for this package is that it comes with two utility programs which enable a teacher to modify options and responses generated by the main program.

This is an especially important consideration when buying well-protected software.

The program makes good use of attractive graphics to maintain interest. Highly recommended.

John Howard Daddy

Enjoy going round the bend

POLE POSITION
For BBC Model B

At long last the eagerly awaited conversions of Atari classics are beginning to appear in the shops under the name of Atarisoft. Of the BBC Micro conversions **Pole Position** must be one of the best known.

Up until now motor racing games of this type have involved racing along a straight road weaving left and right to avoid the traffic. The only attempt at relieving the boredom being a change in the background colour.

Atarisoft's Pole Position scores very strongly over these earlier versions by the inclusion of that missing ingredient, bends.

The game consists of two sections – a qualifying lap and the race itself. As the game begins an airship and banner cross the skyline announcing the start of the qualifying lap.

The controls are simple – left, right, spacebar to toggle between high and low gears, and Return to brake. There is no accelerator – speed increases gradually in each gear.

The trick to achieving a high score is therefore to drive as smoothly as possible, no screeching around the bends, and the brake pedal is definitely taboo.

If you are to qualify for the main event then you must finish in the first eight on this practice lap.

Having put in a good time in practice you find yourself on the starting grid. Depending on your time the number of cars starting in front of you will vary.

The airship announces the start of the big race, and the starting lights appear. Red ... red ... red ... green, and you are away, the air heavy with exhaust fumes and burnt rubber, as you scream down the first straight leaving the opposition trailing behind in your wake (OK, so we all get carried away sometimes).

There is just one thing that puzzles me about the game. If I begin the race in pole position then why am I being hassled by a couple of reckless drivers by the time I reach the first bend?

This minor discrepancy aside, I found Pole Position graphically superior to the original Atari version. The game has been written to such a high standard that it is infuriatingly addictive.

Jon Revis

Editing can be dangerous

HANDLING of numerical data is greatly simplified when it is represented in graphic form. However, the process of converting numerics into graphics is often complex and error prone.

To help, there are programs which do all the slog as well as allowing data to be manipulated as required.

Well known programs of this type for CP/M systems or indeed the BBC Micro with Z80 have price tags well into triple figures. So when I received **Datamaster** priced at £14.90, I approached it with trepidation.

Datamaster consists of four programs on tape which are chained in as required. The first program prints the title page and assembles a short machine code dump.

The second program – Unidatam – handles univariate data. When loaded, the program prints a menu. Through one of the options, you can enter your data then display it in the form of a pie chart or a histogram.

As expected, you can place any text to accompany the diagrams by moving a cursor around the screen and typing the text.

This is where you'll realise that this program is rather badly designed. If you suddenly decide to change or add some data while editing the screen and go back to the menu, all your handiwork is lost for ever.

This means that you must save the screen every time you want to amend data.

Just to aggravate matters, there are some striking omissions. For instance, you cannot explode part of a pie chart, you cannot print text vertically with rotated text and you cannot shade in areas for emphasis.

Most surprising of all was the omission of an easy automatic axis labelling facility.

The manipulation of data is rather clumsy in that you enter the data number you want to change and input the new value without seeing the old value.

The same sort of criticism goes for the other two programs, Bidatam – handles bivariate data – and Multicart – handles multiple bivariate data.

One good thing about this package was its manual. It is clear and precise even though it is cheaply produced on a dot matrix printer, although mine may be a pre-production copy.

Although this is easily the cheapest program of this type for the BBC Micro and I quite liked Multicart, there are superior disc-based programs costing only slightly more.

Shingo Sugiura

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"...Gave steadier pictures than the Microvitec Cub, and the colours were rather better.

It seems that all 'normal' and 'medium' resolution monitors, including the Sanyo, are simply inadequate to deal with the Beeb's graphics and text output.

The JVC was excellent, giving clear, legible results.

Was the JVC better than the Microvitec?* Would I buy one? Yes to both questions."

MODEL REFERENCE	1302-2 High Resolution
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Protects your expensive Micro from foreign bodies while not in use. **£3.50**

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● EPSON RX80 Printer	**£209**
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Epson interfaces fit inside the printer to allow connection using techniques other than Centronics.

RS232	**£25**	RS232 + 2K Buffer	**£55**
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The new Epson JX-80 DOT MATRIX COLOUR printer is fully compatible with the popular FX-80. Using a four colour ribbon, printing can be in 7 colours with speeds of up to 160 CPS. It is capable of 80 characters per line or 137 in condensed mode. Its resolution is selectable from 480 to 1920 dots per line. The printer has a friction and fully adjustable tractor feed mechanisms as standard.

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CANON PW1080	£5.95	£4.75
MICROVITEC MONITORS	–	£5.50

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SAKATA SCP-800 printer/plotter facilitates plotting & printing in 4 colours on paper upto A4 size, using easily replaced pens. In text mode it prints upto 12 CPS. Max 160 Char. per line. In graphics mode it offers full plotting facilities incl. drawing, moving, scaling of text, rotation & drawing of axes. (Write for a sample printout).

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Allows 3 BBC Micros to be connected to one Printer.

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BROTHER HR-15

DAISY-WHEEL PRINTER

Brother HR15 is a high-quality daisy-wheel ideal for a budget printer for serious use. Notable features of this printer include a 3k buffer, 18cps (max), bi-directional printing, proportional spacing, Centronics or RS232 interfaces as standard, optional sheet feeder and an optional keyboard.

With immediate effect, we are offering at no extra cost ON-SITE 12 months Maintenance on all HR15 Printers purchased from WATFORD on or after March 1985.
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(Maximum of 5 ROMs or RAMs of any one type per order). Dealers inquiry welcome.

KAGA KP810

This new Japanese printer has EPSON FX/RX compatible control codes and is functionally equivalent to an FX80 with the added advantage of its 'Near Letter Quality' mode. It is solidly built and features include: Normal, Italic, Enlarged, super/subscript, proportional spacing and user-defined character set. Extras over the FX80 included in the price are Near Letter Quality (NLQ) print ideal for correspondence, Proper adjustable tractor feed, half speed quiet mode and 3K buffer. The printer is bi-directional and logic seeking to give a speed of 140CPS for high throughput in conjunction with the standard 3K buffer. 8K RAM may be added to give more user-defined character sets. Centronics parallel interface + Watford's 12 month NO QUIBBLE WARRANTY.

Special Offer: ONLY **£252** (£7 carr.)

RS232 interface + 2K buffer to connect to other micros. **£89**

KAGA KP910 Printer

Similar to the KP810 but with 17" carriage for wide print. Gives 156 columns of normal print or 256 columns in condensed mode. Ideal for printing out spreadsheets.

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PRINTER LEAD

Centronics lead to connect BBC micro to EPSON, KAGA, SEIKOSHA, NEC, STAR, JUKI, BROTHER, SHINWA etc. printers.

Standard length (4 feet long)	**£7**
Extra long (6 feet long)	**£9**

Continued →

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Top quality 3M – SCOTCH Diskettes from Watford Electronics (Your 3M Appointed Distributors). All discs carry a lifetime warranty. These discs are quiet in operation and insert positively with their reinforced hub rings. Boxes of 10 supplied complete with self stick, disc labels and write protect tabs.

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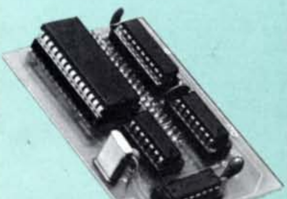
DISC INTERFACE



SIMPLE but SOPHISTICATED

We are proud to bring to you the Watford Electronics Double Density Board for the BBC Micro.
The DDFS supplied is a new version of the popular Watford Electronics DFS re-written to make full use of the capabilities of the new double density controller. Runs the version of Acornsoft ELITE that we sell.

- Increases storage capacity of your Disc Drives by the maximum physically possible. **80% !!!**
- Our system will use the whole of an 80 track drive. Inferior systems do not allow files longer than &3FFFF bytes, but with our system files can be as long as one disc side.
- Discs may be created in either single or double density format with the built in formatter and in single density mode are fully compatible with normal Acorn format discs.
- The density of the disc you put in is automatically sensed by the system and you are informed of the density in the catalogue display.
- The double density system is of course faster than single density.

The Watford Electronics DDFS implements an extremely comprehensive 8271 emulator so that commands passed through OSWORD & 7F are correctly interpreted. Other manufacturers thought that read and write sector alone were sufficient – we decided to implement every command of the 8271 that was physically possible. We have allowed the use of all the special registers including bad tracks, allowed access to deleted data etc., etc. The emulator itself takes up around 1K of compactly written machine code. We reckon it will run many of the protected discs now available. Gain all the advantages of the WE DFS together with much increased storage and compatibility with many existing protected discs.
(please write-in for full technical specifications)

Complete Double Density Disc Interface	**£85**
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Single Density DFS runs Acornsoft's ELITE.

What do the independent press say?

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Without a doubt the most sophisticated DFS software yet written for the BBC microcomputer. This powerful DFS is fully compatible with the ACORN DFS, yet has much increased power due to the additions, carefully designed to make life easier in normal use. It consists of 16K of efficiently written machine code. It is entirely self contained and so does not require a utilities disc to function.

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THE FEATURES OF WATFORD'S SINGLE & DOUBLE DENSITY DFS.

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Please write-in for further detail technical specifications.

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24 Hours

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Now the mystery of buying a suitable interface and disc drive for your BBC micro is revealed in Watford Electronic's new book entitled 'MYSTERIES of DISC DRIVES & DFS REVEALED'. It describes in fine detail, yet remaining very readable to the beginner, how disc drives operate, the type of interfaces available, which type of discs to use on a disc drive and how data is stored on the discs.

There is even a handy section describing the phrases you are likely to encounter, and how to interpret them. This book must be an essential purchase at £5.95, especially if you own or are thinking of buying a disc system.

£5.95 (Book No VAT)

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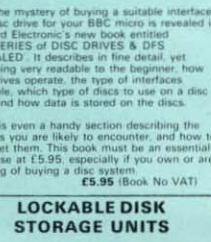

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A complete word-processing package (which can be heavily modified to your requirements, maintaining the large discount). We supply everything you need to get a BBC micro running as a word-processor. Please call in for a demonstration.

EXAMPLE PACKAGE

BBC Model B, Watford Electronics' DFS upgrade, WORDWISE ROM, Twin 200k Epson drives in beige, Zenith 12" Hi-resolution monitor (Green or Amber), Brother HR15 daisywheel printer. Gemini software: BEEBCALC spreadsheet, analysis and DATABASE software on disc. 10 × 3M disc, 500 sheets fan-fold paper, 4 way mains trailing socket, manuals, all leads and BBC carrying case.

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All Microvitec Monitors are 14" RGB in their distinctive right angle sturdy metal case or the new beige plastic case. They are supplied complete with connecting lead to the BBC and a 3pin mains plug.

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Kaga Monitors are 12" RGB colour units housed in an attractive beige plastic cabinet. They all have as standard, a genuine etched anti-glare screen.

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(ALL DRIVES NEW SLIM-LINE)

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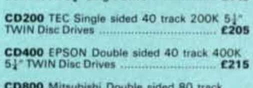
● **CLD200** TEC Single sided 40 track 200K twin 5¼" Drives	**£165**
● **CLD400** Epson, Double sided 40 track 400K, 5¼" TWIN Drives	**£199**
● **CLD800** Mitsubishi/Epson Double sided 80 track 800K, 5¼" TWIN Drives	**£235**
● **CLD800S** Mitsubishi/Epson Double sided 40/80 track switchable, 800K, Drives	**£269**

(CUMANA) DRIVES CASED WITH PSU & CABLES



● **CS100** TEC Single sided 40 track 100K 5¼" Single Disc Drive	**£119**
● **CS200** Epson Double sided 40 track 200K 5¼" Single Disc Drive	**£139**
● **CS400S** Mitsubishi/Epson Double sided 80 track 400K 5¼" Single Drive	**£149**
● **CD200** TEC Single sided 40 track 200K 5¼" TWIN Disc Drives	**£205**
● **CD400** EPSON Double sided 40 track 400K 5¼" TWIN Disc Drives	**£215**
● **CD800** Mitsubishi Double sided 80 track 800K 5¼" TWIN Drives	**£295**
● **CD800S** Mitsubishi Double sided 40/80 track Switchable 800K TWIN Drives	**£299**

- DFS Manual (comprehensive) **£7** (No VAT)

● TWIN Disc Drive CASE with Power Supply to house your own Drives	**£38**

N.B. All single Drives with Power Supply will be supplied in a twin Case for later inclusion of a second Drive.

(Carriage on Disc Drives £7 securicor)

P.S.

- You do not require a formatting Disc nor the expensive 40/80 track switchable Drives when using Watford's sophisticated Disc Filing System which has this facility as one of the many facilities incorporated in it as standard.

Cont.

- MITSUBISHI & EPSON Slimline 400K Disc Drives that we supply are Double sided Double Density, 1 Megabyte unformatted. (With BBC Micro 400K after formatting). When used in conjunction with our Double Density Interface, you obtain 725K formatted. Track density is 96 TPI, track to track access time is 3mSec. These drives are very fast, quiet and efficient. We strongly recommend them.

- Extensive test carried out in our workshop has proved that the BBC Micro's own switchmode power supply is capable of driving 2 disc drives and a host of Sideways ROMs without undue heating. We recommend our CLS & CLD range of Disc Drives which will save you considerable expense without sacrificing performance.

- Please send an SAE, for further technical specification on our Disc Drives.

DUST COVERS

(For our Disc Drives)

Single (without PSU)	**£3.20**
Twin (without PSU)	**£3.85**
Single (with PSU)	**£3.25**
Twin (with PSU)	**£3.90**
Twin (side by side with PSU)	**£3.95**

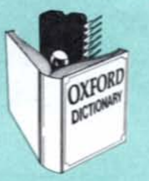
FORTH ROM for BBC

This ROM provides a complete implementation of the FIG-FORTH standard (including editor). Supplied with a large tutorial manual at only **£32**

TINY PASCAL for BBC Micro £54

NEW LAUNCH

ROM-SPELL



A ROM based fast spelling checker essential to serious word processing users of the BBC micro.

Compatible with the popular word processors VIEW, WORDWISE and also with *SPOOLED text files. Allows misspelt words to be changed without returning to the word processor. Simply load the text and execute the spelling checker, correcting the words as you go along, or all at once at the end.

An optimised word compacting technique gives a comprehensive 30,000 word dictionary as standard as well as a user defined dictionary for specialist applications. Efficient data storage also means faster operation, text can be checked at 160 words per minute!!! Equivalent to looking a word up in a standard dictionary in well under half a second!

An ambiguous word checking facility allows partially spelt words to be checked against the dictionary and all the matches displayed. This is ideal when you are uncertain of a spelling and a boon for crossword addicts!

Full access to the dictionary from BASIC allows users to check words from within their own programs. Useful for educational programing and also to compilers of word puzzles and anagram solvers.
Save time spent looking in dictionaries, use ROMSPELL.

ROMSPELL is supplied on a ROM with the dictionary disc and full instructions for Only:

£25

(Please specify 40 or 80 tracks when ordering)

Continued →

THE EPSON FX/KAGA PRINTER COMMANDS REVEALED

for the BBC Microcomputer
(The only Printer Book for the Epson FX-80 compatible printers).

So you bought yourself a new printer, because the salesman in the shop showed you how clever it is and impressed you with all sorts of printouts to show its capabilities – he may even have offered you a special price.

However, now that you have got it home and connected it to your BBC microcomputer, you are wondering how to make it perform these magical tasks. The manual seems to give no clues, and when you type in the example programs, the computer throws the LPRINT statements back in your face.

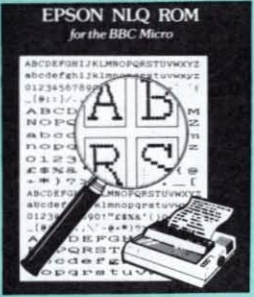
Now what do you do, when this £400 piece of high technology refuses even to move its head, and you have stayed up until 2 in the morning with copious supplies of coffee, desperately trying to print something out. Once again, Watford Electronics comes to your help with our new book entitled 'THE EPSON FX/KAGA PRINTER COMMANDS REVEALED'.

This book describes in plain, easy to understand English how to use your printer (Kaga KP810, Canon PW1080A, or any other Epson FX-80 compatible printer) with the BBC micro, both from Basic and your Wordwise wordprocessor.

It describes in detail how to obtain the maximum in graphics capability from your printer and includes full indexes allowing you to cross index the numerous commands. Every command is explained in detail, with an accompanying BBC Basic program and an example of its use from Wordwise.

This book is superb value at only
£5.95 (Book – No VAT)

EPSON FX/RX NEAR LETTER QUALITY PRINT ROM



Impress your friends and business colleagues with the quality of your letters and printed material with Watford's very simple to use EPSON NLQ! (Near Letter Quality) ROM. Suitable for FX80, RX80, RX80F/T, FX100.

Look at the features:
- Simply type *NLQ80/100 and a single VDU code to use NLQ print.
- NLQ is then available without any modifications from BASIC, WORDWISE, VIEW (with NLQ DRIVER) or virtually any other program or language.
- Single codes select PROPORTIONAL type (yes even on the RX80); ENLARGED type; UNDERLINED type. These features can be used seperately or in any combination.
- Full UK character set.

Standard 'pica size'
Proportional spacing
Enlarged
Underlined
Normal type
The NLQ ROM is incredibly easy to fit and use. Supplied complete with Manual.

Only: £20

DUMPOUT 3
NOW WITH EXTRA FEATURES!

A highly sophisticated screen dump ROM. This has to be the most flexible and powerful screen dump ROM yet produced for the BBC micro. It will put on paper anything you see on the screen, including all Mode 7 facilities etc. We have to admit that there is one facility that we cannot replicate – if anyone can supply flashing ink we would like to know!

The ROM also provides window setting utilities and two new OSWORD calls that allow mode 7 graphics pixels to be read and plotted using the standard graphic co-ordinate system. The latest version includes a graphic dump trigger for dumping screens from games whilst they are running.

Two commands are used to operate the dump routines:
*GIMAGE – This provides a full graphics dump of any Mode (including Mode 8). There are many optional parameters but you need only specify the parameters you wish to change.

- V <scale>, H <scale> – These 2 byte numbers give fine control over the size of the dump from minute to enormous. Unlike other dump ROMs, scale works the same in all modes inc. mode 7.
- R <0-3> – Print dump rotated by 0, 90, 180, 270 degrees.
- I <indent> – Set gap from left edge of paper.
- X <min><max>, Y <min><max> – Selects screen area, by default the whole graphics window is dumped.
- P – Dump shows physical colour values.
- G – Grey scale reproduction, dumps otherwise use a negative scale (white prints darkest).
- T Two tone dump for maximum resolution.
- M <mask> – 8 bit colour mask.
- E – Contrast expansion to make mode 7 text and separated graphics stand out clearly from the background.
- C – All mode 7 graphics are printed as contiguous to improve the shading in graphic areas.
- K – Key-triggered dump. The dump does not commence immediately, but can be triggered off later by pressing <SHIFT><0> or <CTRL><ESCAPE>.
- S – Switch-triggered dump. As K, but the trigger is an external switch (not supplied) connected to the user port. The S option can still work with games that corrupt RAM page D.

*TIMAGE <indent> – Does a fast, text only, dump of the contents of the text window in any mode.

*GWINDOW and *TWINDOW – These commands draw the graphics and text windows, respectively, on the screen and allow them to be changed with the cursor keys. Note that GIMAGE and GWINDOW work fully in mode 7. Designed for use with the following printers: CP80, GP80/100/250, CANNON, STAR, KAGA/TAXAN, NEC, SHINWA CP80, GEMINI, EPSON MX/RX/FX, LPVII, NEC PC8023, DMP100/120/200/400, etc. etc.
Price including comprehensive manual

£22

VIEW

VIEW WORDPROCESSOR
We are supplying the new VIEW version 2.1 allowing printing of memory contents etc **£46**

HI-VIEW

A special version of VIEW designed for use with 6502 2nd Processor. Available on disc, it offers 47K of text memory.

£49

VIEWSHEET (Acornsoft) **£49**

Watford's own Sophisticated VIEW PRINTER DRIVER for Epson FX80 & KAGA KP

To simplify using the full facilities of the Epson FX80 or Kaga KP810 use this printer driver. Full facilities are provided for selecting between fonts etc. The disc includes examples of use and instructions. Available on 40 or 80 track disc (please state which required). **£7**

VIEW DRIVERS FOR JUKI & BROTHER PRINTERS

Only £7

VIEW/VIEW SHEET PRINTER DRIVER for SILVER REED
(Officially approved by Silver Reed)

A range of VIEW Printer drivers to complement the Silver Reed range of printers EXP400/500/550 & 770 EB 50 and converted typewriters EX43/44 & 55.

Only: £7

BEEB PRINTER ROM

"Makes Printing Childs Play"

This utility ROM is designed to simplify using all the facilities of your printer. It has many facilities:

★ Selection of printer modes such as underline, font and size is by 'Single Key' operations.

★ From Wordwise, a single number following OC will select a mode rather than a long and incomprehensible string of control codes. This makes using your printer with Wordwise much more convenient.

★ When using Basic (or other languages) you can have control over the formatting of the output to the printer in the style of a wordprocessor. You can define page top, bottom and side margins etc. with intelligent page skip for binders an option. All supported printers will now respond to form-feed etc. commands.

★ User defined characters are printed as you see them on the screen so that non-standard characters are automatically printed out correctly.

★ Commands select the options for the following printers:
GP100, STAR, NEC, MX/FX, KAGA, LP/VII/DMP100, DMP200.
Operates with either parallel or serial interfaces.

★ Supplied with a 50 page manual that is very comprehensive and easy to follow. Please specify printer type when ordering so that we can send the correct function key strip.

Price: £24

TWO DATABASE MANAGEMENT SYSTEMS

DISCDATA

Discdata is an entirely disc based database handling system. It is extremely easy to use through its comprehensive menu system. The simplicity is such that we do not feel the need to provide explanation on use in the written guidance supplied with the program. The first-time database user will rapidly become familiar with this package designed throughout to be simple and obvious.
Despite the ease of use this system provides all the facilities needed for complex data handling problems. The length of database that can be handled is only limited by the total space on the disc. You can have up to 20 fields with page length records up to 254 bytes in length. Adding and deleting records, amend titles, field names and records. Sort on any field and search for any record or group of records in any field. The database may be re-formatted after creation, the system will re-write all your files for you automatically. You may add extra fields and extend the length of existing fields freely.
Output formatting is very powerful. You are allowed 40, 80 or 132 column output modes going to printer or screen. Selected fields can be put in any order on the screen or printer, either across the paper or down. Output can start or stop anywhere in the file. Decimal fields are automatically totalled and records output are counted. Version 2, now on sale has improved input and amendments procedures giving full record edit as well as the 3 extra features . . . String searching, Calculations on numeric fields, and the ability to create sub files from your main files.

On disc at **Only £17**

(Please specify 40 or 80 track when ordering)

FILE-PLUS

The File-Plus package is even more powerful and flexible than Disc-Data. It is also largely menu driven but has its own command language for file searching. The 16K ROM contains all the normally required routines, with lesser used options supplied on the utilities disc. All input and output formatting is controlled through screen forms. A full screen editing system is used to define a form which allows tremendous flexibility in the format in which your data is displayed. It is very easy to change from form to form so that you can type in your data with one form, and examine it with others. You will typically design several forms before starting to access the database so that you can quickly and easily see the fields of each record that you want to appear in the layout you decide on. The form system is also used for output to your printer.
File Plus has a unique file linking system that allows the entire on-line storage of your system to be used for one database. This can give around 1.5 Megabyte databases using dual drives and double density.
The built in FQL (File-Plus Query Language) can be used for searching the database. Presented in the form of a powerful command language with looping facilities etc. this allows the most flexible access to your data possible. Full arithmetic operations are provided to allow the system to be used for statistical analysis.

Cont.

Operations supported are −, +, *, /, +−999999 9999.9999 and compare facilities =, >,<>>=, >=, <, &.
Many keywords are supported by the language: assign, compare, display, and, goto, iff, ift, print, read, search, spool and update.
Supplied with a very detailed 70 page manual to explain all the facilities with many examples.

Only £43

(Please specify 40 or 80 tracks for the utilities disc)

DATAGEM

Gemini's 24K ROM based DATABASE Management System

Special Offer: **£110**

PEN PAL – VERSATILE LIGHT PEN SOFTWARE

Do you have a light pen that never gets used? Then this piece of software is for you. This package offers many useful facilities that make the light pen a useful device to own. Facilities included are:

- Pixel, Line and Character definition
- Free hand drawing
- All Colours
- Fill, Refill and stripes
- User defined "Brush strokes" plus character definer
- Grid, Scale and perspective aids 2 to 200 points palletable in one design with Circles and "rubber banding"
- Move design/character to any screen position
- Save and Load screens, User defined characters and line drawings for video titles, own programmes etc.

This program has many uses in education and at home. It is supplied with a comprehensive instruction manual.
Works with Watford, RH, Acorn User, DIY and many other Light Pens.
Prices TAPE ________ **£11;** ________ DISC **£12**

LIGHT PEN

This Light Pen for the BBC micro is packaged in a neat pen shape with built in switch. Supplied complete with our sophisticated Pen-Pal software on cassette (see elsewhere in this ad).

Only **£20**

(For software on disc please add £2)

DISC EXECUTOR

Disc Executor is a sophisticated disc utility for the transfer of your cassette programs to disc. If you have difficulties transferring your cassette software to your disc system then this is the answer. It handles 'locked' files and full length adventures (up to &&e blocks) and programs that load below &E00. It is very simple to operate with instructions supplied. It saves you time and money. (Compatible with Single density Disc Interfaces only.)

Price **£10**

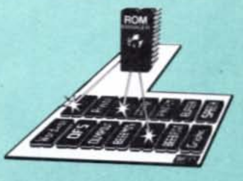
(Please specify 40 or 80 track discs)

ADE

'Systems' complete program development package in a 16K ROM. Full assembling and debugging facilities provided.

SPECIAL OFFER ONLY **£43**

ROM MANAGER



'Provides comprehensive management of all your installed ROMs – BEEBUG Nov. '84'.
This ROM is unique in its capabilities. It allows you, the user, full control over the BBC Micro's sideways ROM paging system with simple to use commands. This ROM is essential for those with several ROMs. At a simple level ROM MANAGER can be used to remove the problem of clashing command names and allow full use of all the facilities of your ROMs. This is coupled with facilities to completely enable or disable various ROMs in the machine including ROM manager itself.
ROM MANAGER can also be used to develop sideways ROMs using the machine's standard memory. This is achieved by sending sideways ROM calls to your code in RAM, saving the expense of fitting sideways RAM for ROM development purposes. ROM status reports are also given by the ROM, including ROM lengths, checksums, entry points supported and current filing system title.

The ROM also provides facilities to examine ROMs, list function keys for editing, modify RAM (using a HEX/ASCII editor) and list ROM titles neatly and concisely.

All selection between particular ROMs is by the name of the ROM and this may be abbreviated for convenience. ROM numbers can also be used if required. This ROM is very simple and obvious to use. All the facilities are explained in the clear and detailed manual.

Price **£22**

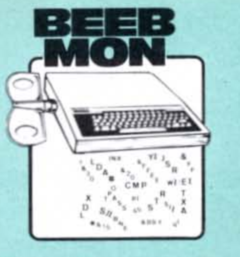
BUFFER & BACKUP ROM

For those with sideways RAM fitted in their machines this utility ROM will make full use of this facility. By using the sideways RAM area for extra memory the following features are implemented:

- ★ 4K or 16K buffer for parallel printer.
- ★ Dumps selection of Disc files to Tape.
- ★ Makes backup copies of tapes on to tape and disc.
- ★ Displays contents of paged ROMs on screen.
- ★ Menu display of ROM filing system contents on Shift-Break.
- ★ Comprehensive manual.

Only £22

Continued →



Watford's own Machine code Monitor ROM written by Andrew Bray (Cambridge), co-author of the BBC Micro Advance User Guide

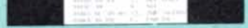
The most powerful and versatile machine code monitor ROM yet written for BBC Micro. It has all the normal memory editing, moving and relocating facilities, plus all editing is with a full screen editor allowing scrolling up and down memory, entering in Hex, ASCII or standard assembler minemonics.

In use as a debugging tool, you run code under a total emulation system. Ever felt a desperate urge to set a break point in ROM? No problem – you can even have breakpoint on reading or writing locations in memory and on register contents. The system fully supports debugging of sideways ROMs e.g. BASIC can fully and easily be run from within Beebmon and from there DFS and other sideways ROMs can be used in total emulation mode.

Beebmon can even run itself. In so doing you can nest Beebmon up to a level limited only by the memory size. Beebmon uses 256 bytes of workspace, located anywhere in memory, even on the 1MHz Bus. Beebmon effectively uses no zero page workspace, so your program (e.g. BASIC) can use any or all of the base page. How does it achieve this? By providing a 6502 interpreter all programs running under it exist in a vertual BBC, so special memory locations like the ROM latch are not actually accessed by your programs, instead they alter a location in Beebmon's workspace. Emulation also allows immediate return to Beebmon command level by ctrl-escape no matter what code is being executed at the time. All this exceptional power and flexibility is complemented by a clear and detailed manual included in a value for money price of:

£24

Disassembler Rom



Discover the hidden secrets of BASIC and the OPERATING SYSTEM with this easy to use progammers tool.

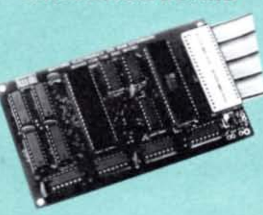
A ROM based machine code Disassembler for the BBC micro. It enables machine code programs to be listed in BASIC/DUMP format and thus is the perfect complement to the built in assembler. It allows Sideways ROMs, files on disk or tape to be listed, and also has a comprehensive editor, allowing mnemonics to be altered directly, as well as HEX, DECIMAL ASCII and BINARY memory editing. There is also a full set of labelling facilities available (up to 3,200 labels), with the major locations and routines already labelled.

Thus DIS-ASM enables any monitor program, such as BEEBMON to be used to much greater effect as it is not necessary to disassemble memory each time the display is altered.

ONLY **£18**

32K RAM

EXPANSION BOARD



Now Watford Electronics brings you the latest state-of-the-art MEMORY EXPANSION BOARD for your BBC microcomputer. It's ribbon cable simply plugs into your micro's 6502 processor socket. This compact board which fits inside the computer doesn't just give you 16k or even 20k of extra RAM, but a massive 32K!!!

There are many more useful facilities available with this board:

● The top 20K of the expansion RAM can be used as the screen display memory, leaving all the standard BBC RAM free for programs or data storage. This allows good graphics and long programs to be combined. For instance you could have MODE 0/1/2 GRAPHICS AND 28K OF PROGRAM SPACE. The extra memory can be used by virtually any language or utility such as BASIC, VIEW, WORDWISE (1.20+), WORDWISE PLUS, etc. and NOW COMPATIBLE with Beebug's TOOLKIT.

● The FULL 32K or the bottom 12K of the expansion RAM can be used as a PRINTER buffer for SERIAL PARALLEL printers, sound channels, RS423, keyboard or speech synthesiser. This allows very long text files to be printed while you are using 28K of program and 20K of graphics! THE BUFFER IS UNIQUE because it replaces one of the BBC Micro's buffers so all the buffer options are available on it, eg. *FX15.21, 138, 145, ADVAL(–no.) etc.

● This board is the IDEAL COMPLEMENT to any WORD PROCESSING system, disc or cassette based. There is no need to wait for slow printers as you can type in long text in 80 column display mode while printing is going on – TWO JOBS DONE SIMULTANEOUSLY!!! (an equivalent printer buffer would cost you £120 +).

● Unlike our competitors, the board is compatible with a vast range of software and hardware available for the BBC microcomputer, including our ROM expansion boards, double density DFS units, and the ATPL ROM extension board. This is because our board is connected to the computer by means of a ribbon cable without soldering. It can either be left in the micro or stuck to the lid with the 4 self adhesive feet supplied.

● The board comes with a comprehensive manual and ROM based software with a large range of commands for machine code and BASIC users, including many *HELP messages.

● Now the ROM has had a host of utilities added to the large number already provided and has been made even easier to install.

Only: £65

GRAPH PAD

With this popular British Micro's Graph-pad, you can add new dimensions to your computer enjoyment. It helps you to create your own application programs by the simple use of the Graphpad. Ideal for Educational use. Supplied complete with Cables, Manual and a two program cassette.

SPECIAL OFFER **£86**

BEEBFONT ROM

BEEBFONT is a remarkable and different concept in BBC software supplied on a 16K ROM. It allows you to display text on the screen in 13 different styles:

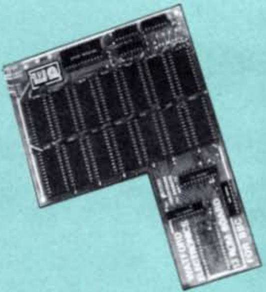
It works in modes 0, 1, 2 and 4 using the full colour capabilities of each mode. Characters are printed in the same way as normal. Selection between the various fonts is very easily achieved with Ctrl-V – press this followed by a font number and the output will continue in the new font. Beebfont ROM is particularly useful in display work with the characters produced at twice the normal size.

You can create your own character fonts with the editor supplied. You can also print-out pre-formatted text files using the special characters with Epson FX, RX and NEC printers. The full range of character styles can be used, controlled from within the text. The editor and spooler program are supplied with the package, on cassette or disc. The spooler allows word processor (Wordwise & View) output to be printed in the new characters.

A twenty page manual is supplied. Please state printer type and media for the editor & spooler when ordering (cassette, 40 or 80 track disc).

SPECIAL PRICE
ONLY **£32**

Mk-2 13 ROM SOCKET EXPANSION BOARD



Now all lines fully buffered – On board battery back-up facility – will now accept EPROMS 2716, 2732, 2764 & 27128 and ROMs 6116 & 6264.

Simply plugs into one of the four ROM sockets currently available in BBC Micro. There are only 5 solder connections to be made. Full instructions are supplied. Unlike other ROM Boards, this board has been ergonomically designed to enable the user, easy further expansion inside the Micro, e.g. Double Density Board, Torch Board, RAM Card, etc., without any clash. (At Watford, we think ahead).

Our Mk2 13 ROM Socket Board enables the User to increase the sideways ROM capacity from the basic 4 sockets upto full 16 capable of being supported by current operating systems. In addition the board is designed with the facility to hold upto 16K RAM, which when switched into operation is automatically selected by any WRITE signal to the Sideways ROM area. This gives the User the ability to write a utility or language and upon pressing break have the utility or language up and running (new ROM software can be developed and tested in situ.)

The Board gives the User, plenty of freedom to explore the possibilities of the new paged ROMs due in the coming months and offers them the chance to develop their own.

All lines are fully buffered and the board meets or exceeds all timings for operation in the BBC Microcomputer. When fully populated, the ROM Board consumes less than half the recommended maximum current limit.

Supplied ready-built and tested complete with fitting instructions.

SPECIAL OFFER: £30

COMPUTER CONCEPT'S ROMS

CARETAKER Basic Utility	£28
Graphics ROM	£28
Disc Doctor ROM	£28
TERMI	£27
COMMUNICATOR	£58

Wordwise

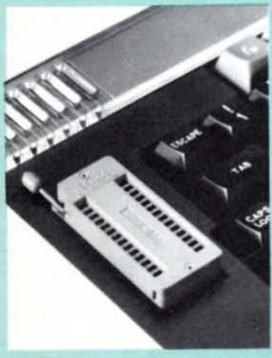
Without doubt a very sophisticated piece of software for the BBC Micro. It has all the features of a professional word processor yet is easy to use.

SPECIAL OFFER THIS MONTH: **£32**

WORDWISE PLUS

Now available from stock **£49**

SIDEWAYS ZIF SOCKET



Now Watford Electronics brings you a ROM board for small budgets or for those of you who do not wish to open up your Micro frequently. It allows you to change ROMs quickly and efficiently with the minimum of effort – no screws to loosen or keyboard to remove. The unit consists mainly of a zero insertion force (ZIF) socket on a small circuit board which is located into the position of the 'ROM Cartridge' and is connected to one of the internal ROM sockets via a ribbon cable.

● Very simple to install. NO SOLDERING REQUIRED. The ZIF eliminates the possibility of damage to your ROM pins when inserting and extracting them.

● The low profile of the socket allows unrestricted access to the keyboard, unlike other cartridge systems. In addition, there are no costly extras, such as ROM cartridges for every new ROM.

● All data and address lines are correctly terminated to ensure correct operation of suitable ROMs with the BBC micro. We also supply a purpose designed see-through storage container with anti-static lining, allowing you to store up to 12 ROMs, protecting them from mechanical and static damage.

● This versatile hardware solves the problem of running out of socket space, simply unplug the ROM and plug in a different one. It is a real must for Professionals and Hobbyists alike.

ONLY **£18**

WORDWISE PLUS UPGRADES

Existing users of Wordwise can upgrade to WORDWISE + for £17. Please return the old WORDWISE package complete with Chip and MANUAL with your remittance and we will send you the new WORDWISE + package.

£17

BEEBUG SOFT

SLEUTH ROM	£25
TOOLKIT ROM	£23
ACORN 1.2 DNFS ROM	£15
ACORN 1.2 OS ROM	£10
ACORN BASIC 2	£20

APPROVED for use
with telecommunication systems
run by British Telecommunications
in accordance with the conditions
in the instructions for use

MODEM 84

PRESTEL TERMINAL

For the BBC Microcomputer

COMMUNICATION
WATFORD ELECTRONICS GIVES YOU
'THE KEY TO WORLD COMMUNICATION'

The Watford Prestel package consists of the B.T. approved Watford MODEM 84 (1200/75 baud full duplex 1200 baud half duplex direct connect) and a very sophisticated Prestel Terminal ROM. Please write-in for full technical literature.

PRICES

MODEM 84 (with Lead & Manual)	£55
MODEM 84 complete with PRESTEL SOFTWARE ROM, Lead and manuals	£75
PRESTEL SOFTWARE ROM +Manual	£20
USER to USER 1200 BAUD SOFTWARE ROM	£18

(At these incredibly low prices for such a sophisticated BT Approved Prestel Terminal, Modem 84 has to be the best buy around)

(Carriage on Modem *£2*)

Nightingale Modem

Now Watford brings you PACE's NIGHTINGALE MODEM PACKAGE including the popular Commstar ROM software for the BBC Micro. Nightingale is considered to be by far the most versatile BT approved modem available at the price for the BBC Micro. It is ideal for home or business use. It offers Prestel/Viewdata baud rates (1200/75 & 75/1200) as well as 300/300 baud full duplex for communication between BBC and other computers, including bulletin boards. A bargain at our

SPECIAL INTRODUCTORY OFFER

(Price includes COMMSTAR ROM & comprehensive manuals) **£119**

COMMSTAR ROM package **£29**

NEW LAUNCH

16K DISC RAM

This is the RAM you've been waiting for!! This battery backed up, write protectable 16K sideways RAM board allows you to run from disk every sideways ROM available. Beware of other sideways RAM boards which are not backed up as certain ROMs will not run in these boards even though the RAM can be write protected. The Battery Backup facility allows retention of DATA after power off. On switch on the Micro will think the WATFORD DISC RAM is a ROM. Features available are:

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'The program is simplicity itself and the user manual is virtually redundant' .... Micro User Jan. 85

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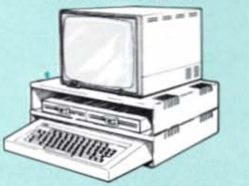

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The software is supplied on an EPROM which plugs into the Micro and is instantly available with a single command (no time wasting as on Cassette/disc loading). It is a fully purpose designed and ingegrated package to simplify ROM development. The system is menu driven with many prompts to avoid any accidents.

Software facilities include:

Load File – Save File – Down Load EPROM – Program EPROM – Verify – Blank Check – Editing of memory contents prior to programming.

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Access

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For the BBC Computer

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3'' disc drives (Hitachi/Panasonic standard)

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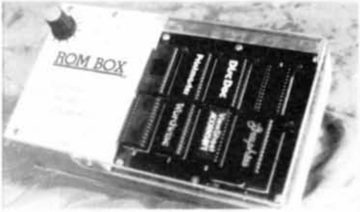
EXTERNAL ROM BOX

For the BBC Computer



MP8	The external ROM box is now in use with BBC computer systems worldwide. It provides 8 extra ROM sockets including 1 Zero Insertion Force (ZIF) socket for easy changing of ROMs and acts as a buffered physical extension to one of the BBC ROM sockets so NO software modifications are required. The ROM sockets are isolated to avoid ROM interaction problems associated with internal ROM boards, also the external box will not overheat. It is supplied with a removable ribbon cable, and DIL socket which plugs into a BBC ROM socket and leads out at the side being clamped by the top of the computer	£49.95
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WIMWIM
WIMWIM

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SUPERVISOR

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PROBLEM PAGE

Your technical queries answered by MIKE COOK

I AM becoming confused about the increasing number of expansion possibilities for the BBC Micro and would be grateful for your help.

My present system is a BBC B with a Watford Electronics DFS, Wordwise, Commstar and Acorn Speech ROMs. My requirements are more ROM space and more memory.

The simplest way would seem to be a sideways ROM board and a second processor. However I am confused about the meaning of sideways RAM, like the Solidisk system.

If I purchased a sideways ROM/RAM board, would this do away with the necessity for a second processor, and how is the RAM used?

Also, if future second processors have larger address buses will this mean money spent now on sideways RAM would be wasted and indeed are these systems likely to be compatible?

Finally, does the sideways RAM take up ROM space, and thereby reduce the number of ROMs one may use? – *John Hammonds, Plymouth.*

● **You can have up to 16 sideways ROMs in the computer at one time. If you have any sideways RAM this reduces the number of permitted ROMs.**

Many boards are available to give you the extra sockets. A Watford Electronics board allows many more, but they are switched in in banks of 16.

Sideways RAM is used to mimic sideways ROM and although you cannot store progams in it you can store data. For each sideways RAM you have you will lose a sideways ROM unless it is switched by some other means like the user port (as used on the Solidisk system).

The only way you can get extra storage space for your program is by using a board like the Aries board that bank switches RAM and separates display and program memory.

If you buy a second processor all your sideways ROMs will still work providing the programs have been written properly (which a lot have not been).

However once you have a second processor your display memory is in the original computer and all the program memory is in the second processor. Therefore while you can still use the memory in an Aries board for storing data from machine code programs it is no longer used for storing Basic programs.

Second drive . . .

I OWN a Cumana 100k single drive, but am now considering buying another single drive unit.

My problem is that the cable will have to be split between the two cases. This I presume is possible.

I would be very grateful if you would advise me on the connections that will have to be made. – *N.D. Blount, Wolverhampton.*

● **A second drive is added by simply placing another insulation displacement edge connector socket on the cable and tightening it up in a vice. The new connector plugs into the new drive.**

Alternatively if you specify a double cable with your new single drive the dealer can supply it.

. . . driving me mad!

I RECENTLY bought Elite on disc for my BBC Micro. However I now have a large problem. In short – it doesn't work.

My set-up is a BBC, a Teac 40 track single sided disc drive which runs from the computer's auxiliary output, and nothing else (ROMs etc). So what's wrong?

The only things that occur to me are that:

● My Beeb is three this month and the symptoms of ULA failure have been manifesting themselves for the last six months.

● My disc head is out of alignment or some other calibration failure is confusing Elite.

However my drive works perfectly at all other times – if a little noisily, although *FX255,0,207 seems to cure that, thank you.

I've even tried sink-testing the drive by making it load the same long file 50 times, etc, and no problems.

What happens with Elite is that often, although not always, when it has to load a new section one of two things happens. Either I get a disc error at 66/03 or wherever, or the screen fills up with a meaningless pattern, reminiscent of loading Basic into Mode 0's screen memory, which then resolves into a screenful of flashing green hyphens.

I tried taking the disc back to the suppliers and changing it, but that made no difference. I have had another thought on the matter, which is that my self-fitted stereo speakers might have been interfering, but removing them made no difference either.

Does having joysticks plugged in during loading interfere with Elite in some way?

As you can see from the somewhat less than methodical composition of this letter I am fairly desperate.

Should I ask Acornsoft for a copy on standard 40 format disc, on the theory that it's this weird 40/80 format that's interfering, or what? I'm totally at a loss. – *Ben M. Rapp.*

P.S. The printer isn't connected when I attempt to play Elite!

● **I have trouble sometimes getting the 40/80 discs to work on my 80 track drive, so it is possible that you are suffering it too. Your trouble lies in the drive. All the other things you mentioned are just red herrings.** ***(All computers should be clear of fish – Ed.)***

I always recommend a separate power supply for discs, even for a single one, as there are question marks as to whether the internal supply can cope with the switch-on surges.

If you have a friend with a

→

Will these parts do the job?

SINCE buying a modem, ex-British Telecom (type 2B), I have purchased the auto-answer kit at £2.50 from Display Electronics and it is with regards the kit and modem that I'm writing for your advice.

In the description of the auto-answer kit the two items mentioned are a thermistor type 1A and a 1.00mf 250V non-polarised capacitor.

The parts received were a thermistor type 1A-1 and a 1.5uF 63V filmcap capacitor. On querying the differences I was told that the parts would do the job, though no explanation was given as to the varying values.

Could you explain these anomalies and describe the pin connection from the BBC B to the 25 way (RS232) of the modem? – *P. Edwards, Stockport, Cheshire.*

● **The capacitor is meant to reduce any sparking from the relay contacts as they open. The bigger it is the better it does the job.**

However, large capacitors are expensive, and 1uF is reckoned to be big enough. At 1.5uF it will be more than good enough.

The thermistor had a –1 on the end of its type number. This is usually done to indicate different grades of component. When specifying the part no dash value is stated, so any grade is good enough to do the job. As to the 25 way RS232 connector, this is the same as shown on page 406 of the User Guide, and should be wired up like a printer as explained in the guide.

From Page 59

BBC computer you could try powering your drive from his computer and seeing if it made any difference.

Otherwise you will have to find someone who has the tools and skill to align your disc drive. A standard 40 track disc might ease your problems, but how are you going to persuade Acornsoft?

Tropical tracks

TROUBLE in the Tropics. My BBC B keyboard has developed an irregularly occurring fault, but only with the W:E:I:7:9 and cursor ↑:↓ keys. They simply don't function despite many "tons" of finger pressure.

The micro is about 20 months old, bought in the UK. Incidentally when the trouble appears, all the other keys operate normally.

To date I've tried keyboard removal and cleaning with a 'switch solvent cleaner' but to no avail. – *P.J. Fletcher, Lutong, Sarawak.*

● **The keys that do not work (w e i 7 9) are all on the same address line. What you have is a broken track on the keyboard.**

This happens because the key switches are sometimes not fully pushed home before soldering and the copper track takes the strain.

It is difficult to spot the break but it will be on the joint between the bright solder and the green track going away from the key switch.

The best way to find it is with a resistance meter or a battery and torch bulb. Test for continuity between the switch contacts you can see connected together.

Switches on the same line as your faulty ones are f0, t, 0, £. The break is probably in the connection between one of these switches and one of your faulty ones. With a bit of patience you should be able to track it down.

When you find it you should place a soldering iron on it and remove the solder. The copper pad should then come off.

Scrape the green solder away from the track and remake the joint by soldering a piece of tinned copper wire across the break. Do not attempt to bridge this with solder as it will almost certainly crack.

Adding a 2nd keyboard

I WOULD like to add a second keyboard to my BBC Micro. Is it a simple matter of unplugging the BBC keyboard and plugging in a new one, or is it more complicated?

Also where can I obtain an extra keyboard?

I would like to know if it is possible to run the 6502 second processor on a cassette based system.

If I do have to get a disc drive do I also have to buy the 'old' DFS, 0.90, or do I just use the one supplied with the second processor. Also is hi-Basic Basic I or II?

Finally what does the 'LINE' (Ctrl + f8) command do? – *Anas Faraj, Bahrain.*

● **You do not say what you want a second keyboard for. If you unplug the old one then you still only have one!**

The best way to add a second keyboard is by using the RS432 input to your BBC computer. Then a simple *FX2,1 would switch over to your remote keyboard and a *FX2,0 issued from the second keyboard would give you command again from the internal keyboard.

You can get a serial keyboard from many sources. One such is Verospeed, Stansted Road, Boyatt Wood, Eastleigh, Hants. SO5 4ZY. The order code is 259-26408A.

It will cost about £110, but you might find that some of the symbols keys produce the wrong symbols due to the fact that the BBC computer uses slightly different standards from most other people. You will also need to supply it with 5 volts at 100mA.

You can run the second processor on cassette and you do not need to buy a DFS, as the second processor comes with one (if you do have 0.90 it must be removed). Hi-Basic is to all intents and purposes Basic II.

The LINE command is part of INPUT LINE and allows you to enter a string variable that contains commas (normally a string delimiter).

IF you have a technical query for this page, send it to Mike Cook, *The Micro User*, Europa House, 68 Chester Road, Hazel Grove, Stockport SK7 5NY.

Letters on other subjects should be sent, as usual, to Micromail, which this month starts on Page 151.

Random access filing

My problem concerns random access filing. I get one of two errors when I add to the disc file, and I can't find any detailed documentation of the errors.

The first is "End of file". The User Guide describes this as "End of file has been reached" but in what way is it an error?

The other error is "Can't Extend".

I only have a dozen records!

The program works in other respects – searching, deleting etc. – *Graham Conridge, London.*

● **The "End of file" error message is produced when you try to read past the end of a file – that is, to read more than is in the file.**

This can be caused by reading more than you should or not writing as much as you think.

The "Can't extend" error message is produced when you try to increase the length of a file and the file is not the last one on the disc.

You see the disc allocates space for each file in a very simple manner. It uses contiguous sectors, so if your file is the last one to be allocated it can always extend it by adding more sectors on the end.

However if you have saved something else to disc since the file was created there is no room to put any more sectors on the end.

The solution is to write dummy records to a file when it is first created. In that way you will reserve the space you need.

RAM chips

CAN you give me some idea of what RAM cards for the BBC would use the HM6264P-15 RAM chip, as I have some and would like to expand the RAM.

Could you also confirm that any added RAM has to be treated like paged ROM? – *Martin Underhill, Woking, Surrey.*

● **I know of nobody who produces a bare board that uses these chips. As they are 64k chips they are a little awkward to fit into the memory map.**

What you could do is make a paged RAM board that appeared in the Jim I/O address space.

However, this could be used for storing only data and not programs. All extra RAM has to be paged. If you use it as paged ROM then the paging software and hardware is already built into the computer.

If it is paged in any other way the paging software must be tapped into the operating system.

This is how the Aries board works – by paging the memory whenever a VDU command is encountered. Thus it automatically separates program space and display space.

Formatting problems

I HAVE had a Cumana 40 track dual disc drive for six months now. Everything was fine until I tried to format a set of 10 discs. They all passed the test except for one when the computer came up with "Fatal formatting error on disc".

Could you please tell me why this happens and if I can do anything about it? – *Victoria Star, Guildford, Surrey.*

● **This happens from time to time – you have got a bad disc. Despite quality control they do occasionally turn up.**

It could also have happened if the disc had been damaged in some way. There is probably some blemish or scratch on it.

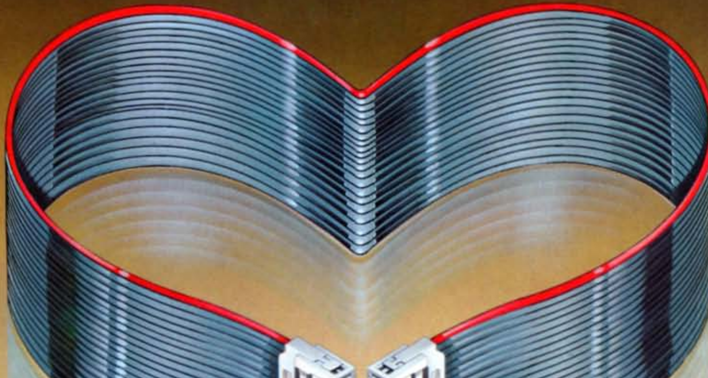
You can try again and reformat it. If it will not then you could try to erase the disc before you try again. To do this wave it over an electro magnet powered by AC. Then, as you wave it slowly move it away. At a distance of about ten feet you can turn the magnet off.

Make sure no other magnetic medium is in the area.

You can try a similar trick with a permanent magnet from a loudspeaker, but it is not as thorough.

If all else fails throw the disc away and chalk it down to experience.

WHY MICROS LOVE MT80



Most leading low cost Micros, eg BBC, Dragon and Sinclair QL love the MT-80 printer from Mannesmann Tally. It is fully hardware compatible and with a range of cable options, gives trouble-free straight through plug-in facilities.

You'll love it too, for its sophisticated looks, and its range of *standard features*, which include 80 col, 80 cps optimised bi-directional printing with dot addressable and line graphs, quick tear-off facility, friction and tractor feed, and easy change cassette ribbon. And all for an ex-VAT price of around £200.

Options include <55dBa sound reduction kit and 2K buffered serial interface.

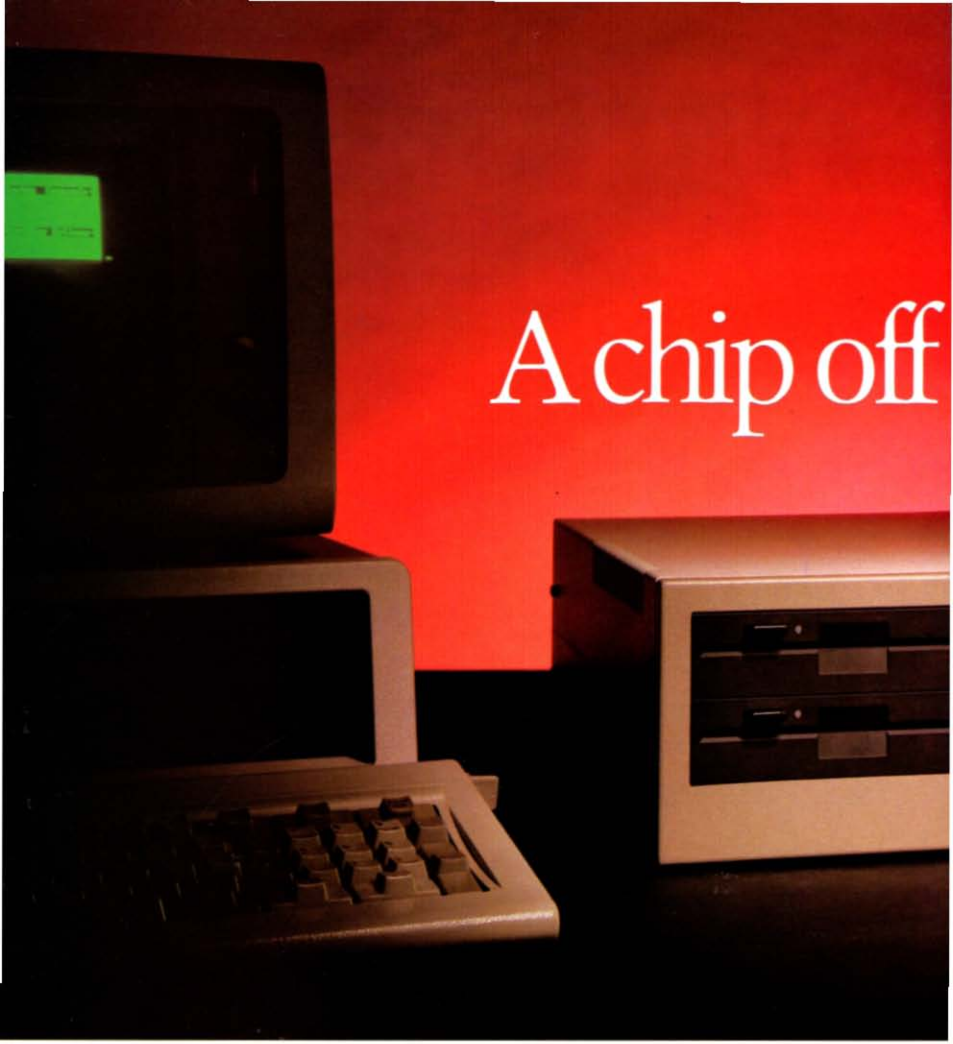
The dealer who supplies you is supported by Mannesmann Tally, Europe's leading printer manufacturer. Your guarantee of continued support and assistance throughout the life of the printer.

Ask your nearest dealer for a demonstration, or phone us today for full details. Either Annie, Sali, Terry or Geoff will be only too pleased to help you.

MANNESMANN *TALLY*

THE FIRST NAME IN PRINTING

Mannesmann Tally, Molly Millar's Lane, Wokingham, Berkshire RG11 2QT
Telephone (0734) 791619/791533 Direct Lines or (0734) 788711 Switchboard



The chip, of course, is the 8088 as used in the IBM® PC. The operating system is customised to MS™-DOS compatibility. The user memory is 256K RAM, that's four times as much as big brother. The floppy disc storage is 720 Kbytes, that's more than double the basic PC. We've only got two expansion slots, but there again we use them for expansion and don't need to tie them up with basics such as colour graphics or printer ports.

We are disc compatible to Lotus 1-2-3 and most other popular business software. And hardware compatible, accepting auto-dial/auto-answer internally housed modems, networking and memory expansion cards, plotters and just about any board level product developed for the IBM® PC.

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COMPUTERS

Technical Specification • 8088 16-bit CPU (5Mhz) • 256K RAM • MS™-DOS operating system customised to IBM PC compatibility • Twin double sided, 5 ¼" floppy disc drives (each 360K formatted) • 2 IBM PC compatible expansion slots • Free PSION XCHANGE software (Abacus, Easel, Archive, Quill) • Software compatibility allows Lotus 1-2-3 and popular IBM PC business programs to run without modification, subject to constraints of BBC keyboard and display • Acorn Disc interface is not required • Keyboard, text and graphics by BBC Model B Micro.

27 MORE COLOURS FOR YOUR MICRO

The 19th century artist Seuràt used a technique called pointillism to create unique colour effects on canvas.

Now PETER WALKER applies the same principle to the micro screen and puts those pixels all in a dither.

PIXEL dithering is a method of mixing different coloured dots on the screen to get more colours than you have normally available. In fact using this method it is possible to give your BBC Micro 27 more colours.

Program III on Page 114 is designed to give you the ability to do this. It works by testing to see whether two adjacent screen dots, called pixels, are set to a particular flashing colour.

If they are, they are changed not to that colour, but to the new colours specified by the programmer. This will then give the effect of increasing the BBC Micro's palette by another colour.

Before we examine Program III in detail though, let's look at the technique behind it.

The principle is quite simple. It works by fooling your eyes into thinking you are seeing one colour instead of two. If we put a red dot next to a blue dot our eyes can distinguish them as two different colours, but if they are very close together we cannot separate them. Our eyes tend to mix them, and we see a shade of purple.

To get a strong impression of this effect we need to alternate the coloured dots on every other line, as in Figure Ia. In this way no one colour can be clearly seen, otherwise we get coloured lines as in Figure Ib, which are not as useful.

We can do this in a number of ways, some quicker than others. One is to plot the individual points onto the screen using Acorn's PLOT statement. This works well, but it has the disadvantage that it is too slow to be of much use.

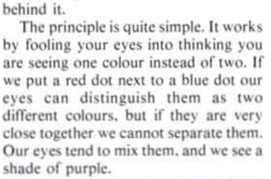


Figure Ia: True dithering-alternating dots

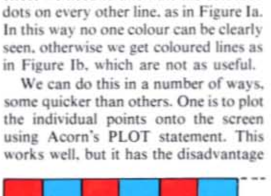


Figure Ib: Failure to alternate produces lines

The other method is to work out the numbers that are stored onto the screen for each colour, and then store these numbers onto the screen byte by byte. Since this way is very fast, I have used it as the basis of Program III.

Having decided on our approach, we come to our first problem – each screen mode stores the coloured dots in different ways, so we have to decide which screen mode we are to use. As more colours can be achieved using Mode 2 it would seem obvious to use this mode.

Figure II shows part of the screen map for Mode 2. This starts at address &3000 and, although we don't show it, ends at address &7FFF.

Look closely at the numbering system. The screen bytes' addresses do not increase by ones across the lines of pixels as you'd think they would, but go down the screen for eight bytes, then back up to the top and start again. This is done to make it easier to store characters onto the screen, as most are built up from eight bytes.

This creates another problem, for to dither we need to go straight across each line, changing the appropriate pixels. That is, we would need to consider &3000, followed by &3008, &3010 and so on before starting the next line of pixels at &3001, &3009 etc.

We have to do some careful number juggling to get this to work.

If you want to see how the screen layout works in more detail, see Kevin Edwards' excellent series of articles on machine code games, which started in the February issue of The Micro User.

Now the screen layout has been considered the next thing to do is to find out how the BBC Micro stores its coloured pixels.

Each byte of the screen memory holds two pixels. These are combined as shown in Figure III. Figure IV shows how this works in practice, giving us a

Colour	Mask	Binary mask
BLACK	0	00000000
RED	3	00000011
GREEN	12	00001100
YELLOW	15	00001111
BLUE	48	00110000
MAGENTA	51	00110011
CYAN	60	00111100
WHITE	63	00111111

Table I: Masks giving both pixels identical colours

	COLUMN					
	0	1	2	---	78	79
HIMEM→ ROW 0	&3000	&3008	&3010	-	&3270	&3278
	&3001	&3009	&3011	-	&3271	&3279
	&3002	&300A	&3012	-	&3272	&327A
	&3003	&300B	&3013	-	&3273	&327B
	&3004	&300C	&3014	-	&3274	&327C
	&3005	&300D	&3015	-	&3275	&327D
	&3006	&300E	&3016	-	&3276	&327E
	&3007	&300F	&3017	-	&3277	&327F
ROW 1	&3280	&3288	&3290	-	&34F0	&34F8
	&3281	&3289	&3291	-	&34F1	&34F9
	&3282	&328A	&3292	-	&34F2	&34FA
	&3283	&328B	&3293	-	&34F3	&34FB
	&3284	&328C	&3294	-	&34F4	&34FC
	&3285	&328D	&3295	-	&34F5	&34FD
	&3286	&328E	&3296	-	&34F6	&34FE
	&3287	&328F	&3297	-	&34F7	&34FF
ROW 2	&3500	&3508	&3510	-	&3770	&3778
	&3501	&3509	&3511	-	&3771	&3779
	&3502	&350A	&3512	-	&3772	&377A
	&3503	&350B	&3513	-	&3773	&377B
	&3504	&350C	&3514	-	&3774	&377C
	&3505	&350D	&3515	-	&3775	&377D
	&3506	&350E	&3516	-	&3776	&377E
	&3507	&350F	&3517	-	&3777	&377F

Figure II: Section of Mode 2 screen memory

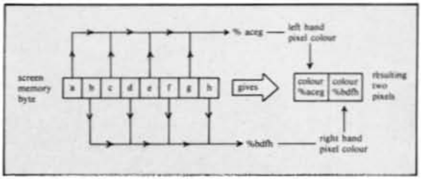


Figure III: How Mode II interweaves pixel colours in memory

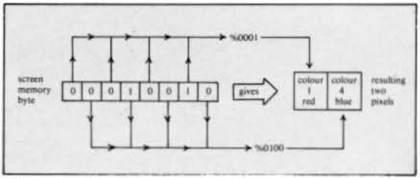


Figure IV: How interweaving works in practice

red pixel followed by a blue one.

To make use of this information a way needs to be found to extract the left or the right pixel from the memory byte. This can be done simply by masking out the parts that are not needed.

Masking is done by using a logical AND operation on the object number. If we need to know the code number for a red pixel two colour masks are needed – one for dealing with the left pixel and one for the right. The two masks in question are &AA and &55. &AA being the right colour mask and &55 being the left colour mask.

All we need to know now is the numbers representing each of the eight colours when *both* pixels are set to the same colour, as in Table I.

If you type in Program I and run it the screen should fill with blue. Replace the colour number in line 30 with any of the numbers shown above and you should see a different colour.

Now we can do this, let's try to combine two colours red and blue, assigning each to alternate pixels.

To get a red left pixel we use:

```
&AA AND 3 = 2 ( %00010 )
```

To get a blue right pixel we use:

```
&55 AND 48 = 16 ( %10000 )
```

The required colour number is equal to 2+16=18 (%00010010). So by adding these two numbers together we get the colour number we require to display a red and a blue pixel.

If this number is put into Program I as the colour number (line 30) you should see a series of red and blue lines going down the screen. You could try combining other colours and seeing if you have got it right.

Once we understand how we can store colours on the screen it is only a small step to get pixel dithering to work. What needs to be done now is to choose a colour that we want to change.

As most people who use colour graphics tend to use only colours 0 to 7, it would seem reasonable to use colours 8 to 15 for our "new" ones. We don't lose anything since it is still possible to use these colours even when pixel dithering.

These colour numbers can be tested very simply. As we've seen, to get our dithered pattern we have to consider two dots of colour at a time.

Each screen byte contains two pixels, so by extending the colour mask table shown above it should be possible to test for both of these in one go by testing the contents of the screen against the correct colour mask number.

Program III, the main one, should be typed in as shown in the listing except

Turn to Page 114

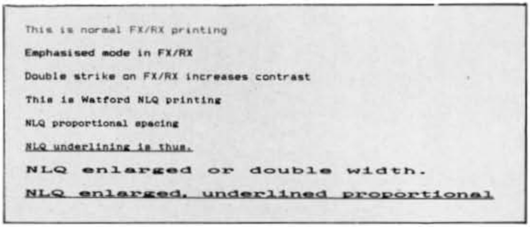
```
 5 REM PROGRAM I
10 MODE 2
20 FOR I = &3000 TO &7FFF
30 ?I=48: REM Colour number
40 NEXT I
50 END
```

Program I

```
  5 REM PROGRAM II
 10 CALL&0900
 20 MODE2
 30 COLOUR136:CLS
 40 *DITHER 3,6,8
 50 REPEAT
 60 RESTORE 140
 70 FORI=1 TO 30
 80 READ A%,B%
 90 COLOUR136:PRINTSPC(20);
100 *DITHER A%,B%,8
110 NEXTI
120 UNTIL0
130 END
140 DATA 7,7,0,7,3,7,3,3,3,4,0,3,2,
7,3,6,2,3,2,2,6,2,1,2,6,7,4,7,0,6
150 DATA 6,6,4,6,4,4,2,4,1,7,5,7,1,
5,1,1,0,1,3,5,1,3,4,5,0,5,5,5,1,4
```

Program II

NLQ: A Nice Little Quill?



```
This is normal FX/RX printing
Emphasised mode in FX/RX
Double strike on FX/RX increases contrast
This is Watford NLQ printing
NLQ proportional spacing
NLQ underlining is thus.
NLQ enlarged or double width.
NLQ enlarged, underlined proportional
```

NLQ ROM
Watford Electronics

I THOUGHT I was going to have to buy an expensive Epson LQ100 printer in order to get high quality printing with the speed and versatility normally available from a matrix printer.

However Watford have produced an EPROM which enables my Epson RX80F/T to print with near letter quality (NLQ)!

Working on the FX series as well, the 8k chip is, as usual, easy to install, occupying one of the sideways ROM sockets. *NLQ80 (or *NLQ100 for 100 character printers) initialises the ROM, setting up the buffer insert vector to point to the NLQ ROM and reserving one page of workspace at &A00.

The instructions indicate that the workspace can also be set in other positions to avoid clashes.

*NLQTYPE in direct mode or VDU1,129 in Basic alters all printing into NLQ mode. This sets the least significant bit in the number added to 128, the next four significant bits being used to set some special features.

Adding 2, 4, 8 or 16 to VDU1,128 sets proportional spacing, underline, temporary enlarge or enlarge respectively. Temporary enlarge gives double width only until the next carriage return or until cancelled, whichever is the sooner.

These special effects can, of course, be set together so that proportionally spaced and enlarged would be set by using VDU1,146.

Cancelling each command is achieved in similar manner by adding to the base 192. Cancelling NLQ printing requires VDU1,193, while cancelling all NLQ effects is VDU1,223. The ROM can be turned off using *NLQOFF when not required.

As with all good things, there are one or two catches. In NLQ mode *FX6,0 does not work, so that the dipswitch in the printer that enables a line feed with every carriage return must be set to avoid overprinting.

The Escape key is disabled when text is being transmitted to the printer, so that a printout can only be stopped by holding Escape down and waiting for a line end. In order to send normal control commands to the printer NLQ printing must be stopped and restarted using VDU1,193,1,command,1,129.

The quality of printing produced by the combination of Epson RX/FX and NLQ ROM is tremendous – see the example above – and it is generated at a speed not much slower than double strike printing on the same Epson.

I feel that Watford's NLQ ROM is a valuable asset to anyone who requires better quality printing from their RX/FX printer and at £20 is good value.

It remains for Watford to indicate which of the Epson compatible printers are also supported by NLQ ROM.

Ian Whitmore

Now – a 16k DFS

DNFS
Acorn

A NEW DFS has crept onto the marketplace with a surprising lack of fanfare by the company concerned. This is, of course, the Acorn 1.20 DFS.

The old DFS, the 0.90, was supplied on an 8k eprom. The new has now been ROMed onto a 16k chip known as the DNFS, as it now combines the DFS with the Network Filing System (for Econet) as well as Tube software, which drives the Tube if a second processor is fitted.

If you've already used the 0.90, you'll quickly notice the difference. The first and most dramatic is in its speed. As you can see from the benchmarks, it is up to twice as fast.

The main reason would seem to be that the new DFS optimises the movement of the read/write head between tracks. This means that you're much less likely to suffer a lot of stepper motor clattering, which can be more than a little worrying to beginners, especially with packages such as Wordwise.

In order to achieve this vast improvement the DFS code has extended to just over 8k. Also noticeable are the shorter, more cryptic messages, witness to the squeezing together of the DFS, NFS and Tube software.

At the same time as increasing the speed they've sorted out some of the quirks of the old DFS. For example if the current directory was 'B' and you saved a program with SAVE":1.prog" the old DFS would save it as ':1.$.prog' rather than ':1.B.prog' as would happen with the new DFS. Pressing the Break key no longer resets the currently selected disc drive.

The new DFS now seems to be issued with all the new disc interfaces. It should be available shortly to those who want to buy it separately.

The question arises: "Is it worth while updating my old 0.90 DFS?" If you're going to get a 6502 or Z80 second processor then don't bother as it will be included in the price of the second processor.

If you just use your disc to load and save programs there's not that much of a speed improvement. If you make fuller use of the filing system with word processing, databases or your own programs I think the DNFS is well worth the £20.

BENCHMARK TEST	0.90 DFS	1.2 DFS
	Time in secs.	
1 OPEN + CLOSE files *1000	4.3	5.1
2a PRINT 1000 numbers	15.7	6.7
2b PRINT 100 strings	61.0	24.8
3a INPUT 1000 numbers	12.6	5.8
3b INPUT 100 strings	57.1	23.0
4 BPUT 1000 bytes	5.0	3.4
5 BGET 1000 bytes	3.9	2.5
6 Move PTR 1000 places	2.2	2.2
7a Write test relative file	62.9	25.9
7b Read test relative file	58.4	23.5
8a Write relative file backwards	240.3	99.6
8b Read relative file backwards	99.9	39.2

Jim Notman

ONE MORE MONITOR..

KMON
Kansas City Systems

THIS is yet another entry into the growing number of machine code monitors available for the BBC Micro. In an attempt to be as straightforward as possible commands are one letter long and may be followed by a number of parameters.

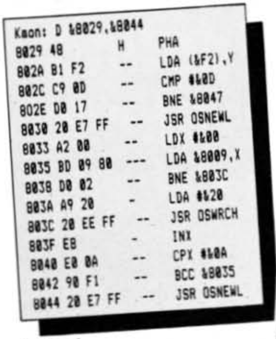
Numbers default to decimal so that hexadecimal numbers must be preceded by an & as in BBC Basic. (I know many who prefer monitors to default to hex.)

Rather than always referring to addresses as numbers, labels can be used. The labels using the names of the operating system calls and vectors have already been defined – the label OSBYTE is given the value &FFF4 and BRKV &200.

Although it mentions the Advanced User Guide it has not defined all the vectors and calls given there, though all of those mentioned in the User Guide are present.

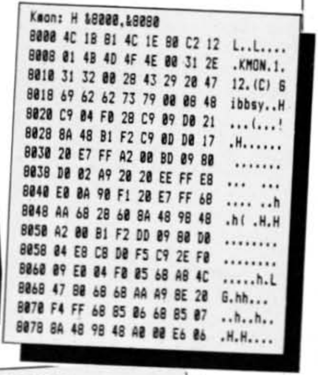
The disassembler is simple to use and makes use of the predefined labels (see Figure I).

The single pass assembler is best used →



```
Kmon: D &8029,&8044
8029 48         H    PHA
802A B1 F2      --   LDA (&F2),Y
802C C9 0D      --   CMP #&0D
802E D0 17      --   BNE &8047
8030 20 E7 FF   --   JSR OSNEWL
8033 A2 00      --   LDX #&00
8035 BD 09 80   ---  LDA &8009,X
8038 D0 02      --   BNE &803C
803A A9 20      -    LDA #&20
803C 20 EE FF   --   JSR OSWRCH
803F E8         -    INX
8040 E0 0A      --   CPX #&0A
8042 90 F1      --   BCC &8035
8044 20 E7 FF   --   JSR OSNEWL
```

Figure I



```
Kmon: H &8000,&8080
8000 4C 1B 81 4C 1E 80 C2 12  L..L....
8008 01 4B 4D 4F 4E 00 31 2E  .KMON.1.
8010 31 32 00 28 43 29 20 47  12.(C) G
8018 69 62 62 73 79 00 08 48  ibbsy..H
8020 C9 04 F0 28 C9 09 D0 21  ...(...!
8028 8A 48 B1 F2 C9 0D D0 17  .H......
8030 20 E7 FF A2 00 BD 09 80   .......
8038 D0 02 A9 20 20 EE FF E8  ...  ...
8040 E0 0A 90 F1 20 E7 FF 68  .... ..h
8048 AA 68 28 60 8A 48 98 48  .h( .H.H
8050 A2 00 B1 F2 DD 09 80 D0  ........
8058 04 E8 C8 D0 F5 C9 2E F0  ........
8060 09 E0 04 F0 05 68 A8 4C  .....h.L
8068 47 80 68 68 AA A9 8E 20  G.hh...
8070 F4 FF 68 85 06 68 85 07  ..h..h..
8078 8A 48 98 48 A0 00 E6 06  .H.H....
```

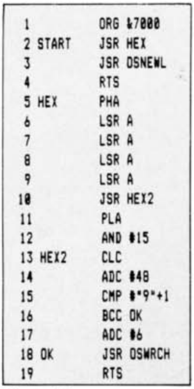
COMMAND TABLE

Action	**Syntax**
Single pass assembler	A address
Set breakpoint	B n=address
Clear breakpoint	C n
Disassemble	D start address, <end address>
Edit memory	E address
Fill memory	F address, address, byte block
Hex dump	H address, <end address>
Insert into source code	I <line no.>
JSR to address	J address, <parameters. . .>
Kill source statements	K <line no.), <line no.>
List source code	L <line no.), <line no.>
Move block	M start, end, dest
Overwrite line	O line no.
Select paged ROM	P rom-number
Relocate program	R start, end, org, <dest>
Search for byte	S start, end, byte
Display breakpoint table	T
Move user table	U address
Set variable	V label=expression
Display variable	V expression
Word search	W start, end, address
Give user table extent	X
Compare blocks	Y start, end, block
Delete label	Z <label>
Set scrolling speed	$ <speed>
Assemble source code	@
Save	s <filename>
Load	l <filename>

From Page 67

with short pieces of code that have worked out before typing in.

The two-pass assembler has much the same facilities of BasicII. It does produce neater listings, moving between label, mnemonic and operand fields using the TAB key. (Figure II gives an example from their manual.)



```
1          ORG &7000
2 START    JSR HEX
3          JSR OSNEWL
4          RTS
5 HEX      PHA
6          LSR A
7          LSR A
8          LSR A
9          LSR A
10         JSR HEX2
11         PLA
12         AND #15
13 HEX2    CLC
14         ADC #48
15         CMP #"9"+1
16         BCC OK
17         ADC #6
18 OK      JSR OSWRCH
19         RTS
```

Figure II

EQUB, EQUW and EQUS of BasicII have been changed to DFB, DFW and DFS. Rather than setting P% to point to the assembler origin the command ORG is used. An extra command SPC reserves space, equivalent to P%=P%+space_reserved.

Memory commands that you'd expect to find in a monitor such as fill, move, relocate and edit are there.

Debugging facilities to say the least fall short of what a good monitor should have. Although up to 10 breakpoints can be set, these can only be set in RAM and are not conditional.

A number of zero page locations need to be set so that they can be loaded into the accumulator, X, Y and status registers when code is called with a J command.

There is no single stepping command. The nearest you'll come to this is by setting the breakpoints and looking at the contents of the registers when a breakpoint is reached.

The manual I saw was a preliminary version. Unfortunately it contained a considerable number of errors which have hopefully been tidied up in the final version. Otherwise it gives a simple account of all the commands and memory usage.

While this package has a reasonable assembler and disassembler, it's not really in the first division as a monitor.

Jim Notman

Routine routines on disc

Source Library Manager
Guardian Software

THIS ROM based utility is aimed at the very structured programmer. It offers a means by which procedures may be individually written and then saved to disc, thereby offering the facility for a definition file to pull out the required files back from the disc and combine them in the computer to form a complete program.

The general idea is that this method will use disc space more efficiently as there will be less duplication of commonly used procedures.

The manual to explain this relatively simple concept runs to 15 A4 pages, most of which just explain the virtues of SLM. The actual meat of the document could be drastically reduced and would enhance readability significantly.

The program is invoked by typing *SLM, upon which the screen reverts to Mode 7 and the main menu page appears. The options from here are to save or load the current piece of Basic as a procedure, save or load a definition file and a few other options enabling deletion, compacting and file extensions.

In use one must first format an area of disc for use as the library file store. This area can be extended if desired. However this is a very slow process – 60 seconds for 10 tracks.

Files will be stored here and will not be accessible without the SLM ROM installed. A programmer might then write, for instance, the start of a program involving mode settings and procedure calls.

SLM would then be called and instructed to save the file in RAM to disc as a source file. The programmer would then exit from SLM, type NEW and write the first procedure.

On completion SLM would be called once again and the procedure would be saved as a second source file. As well as being able to save each file using an eight character word it is also possible to label each file with a 20 character comment, possibly a reminder of a procedure's parameters.

Assuming that this example program consisted of a start section and a single procedure it would then be required to write a definition file.

This consists of a psuedo Basic program of arbitrarily sequential line numbers each followed by the identity of the source file required in double quotes, such as 10 "START", 20 "PROC". SLM would then be called and this file would be stored as a definition.

To test the program SLM would be requested to "construct defined program" from the menu, and upon giving it the name of the definition file it would build the basic program, in this case by simply joining the first file to the second.

Apart from the dreadful manual, I disliked the menu method of control and especially as it only worked in Mode 7. It would have been easier to use one of the currently available Basic tools packages to save and load individual procedures and merge them into memory when required. A program could then be defined using an EXEC file to call the merging routines.

This would also allow the files to be read from the filing system in the normal way.

I was pleased to note however that the ROM needs no workspace and will operate with a second processor attached.

Library systems are commonly used in higher level languages but these operate very differently from Basic and in many ways subroutines are more exchangeable.

So I am not convinced that beyond keeping disc files in some sort of order and writing readable structured programs a small computer can benefit from a library management system.

Tim Craig

BBC and Electron

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Both these compilers come with a manual which has been carefully designed, not only as a quick reference guide, but also as a full tutorial for those new to Pascal.

Resident and Disc Compiler

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Unlike other compilers, Oxford Disc Pascal allows you to compile on the BBC and then relocate your program so that it will run on the BBC **and** on the Electron. The relocated program will run without a Pascal **ROM** and can be loaded and run from tape or disc just like any other program.

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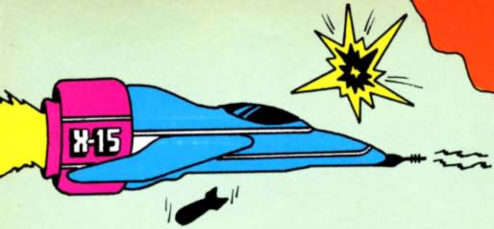


X-15

THUNDERING in from over the sea underneath the clouds of asteroids in your rocket propelled X-15, you begin your attack on the enemy territory.

Squeezing the trigger in front of you sends rockets and bombs carrying destruction, but one slip and your craft will be reduced to molten metal.

In this version of the classic game you move an X-15 through a sideways scrolling landscape of hills, tunnels and cities.

You are attacked by robot planes which try to ram you, and by surface to air missiles. You must also try to destroy fuel dumps and the SAM bases.

In addition there is the ever present danger of colliding with an asteroid or the landscape.

Points are awarded in proportion to the difficulty of the targets you hit – asteroids 5, robot planes 10, fuel dumps, SAMs and SAM bases 50, plus 100 for each section of landscape completed. When you have destroyed a target you move through the debris unhindered.

The program hinges on producing fast sideways scrolling without using machine code.

To move the BBC computer display sideways two VDU23s are used to write new values for the start of screen memory address to registers 12 and 13 in the 6845 cathode ray tube controller (CRTC) chip.

In the program this is done in line 360. However the snag is that after the VDU23s all the usual functions which access the screen like TAB(X,Y) won't know about the change and will operate at their old positions before the shift.

To make things work properly it is necessary to change the operating system copy of the starting address of screen memory held in locations &350 and &351. This is done in line 340.

A few other interesting techniques are used in the program. For instance, to speed things up strings are not changed with the usual string operators. Instead they are kept in reserved blocks of memory and changed directly with the indirection operators.

*FX19 is used in line 350 to synchronize the scrolling with the TV frames. Taking this out will make the program faster, but produce some flickering.

Collisions of objects on the screen are detected by PEEKing at the screen memory. In order to help discover the identity of an object in this way, different logical colours are used for them.

Five logical colours are set to red corresponding to red landscape, red asteroids, fuel dumps, SAMs and robot planes.

A nice touch is the option to define your own keys. Since negative INKEYs are used to detect them you could use the cursor keys to move the X-15 up and down and the Shift and Caps Lock keys for the rockets and bombs.

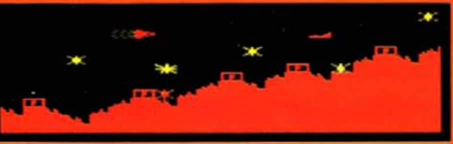
PROGRAM STRUCTURE

Lines	
80-220	Main program.
80-130	Set up for game and give instructions.
140-210	Repeat loop which keeps playing games.
160-190	Keep scrolling until X-15 destroyed.
170	Selects landscape.
180	Generates landscape and scroll: inner loop of the game.

VARIABLES

O%,W%,U%,V%	Used in controlling the sideways scrolling to put the correct values in the CRTC registers.
X%,Y%	x and y coordinates of rocket fired by X-15.
F%	Rockets fired flag and the screen memory location of the rockets.
G%,H%	x and y coordinates of bomb. G% is also used as a flag to detect dropping bomb.
M%	Screen memory location of bomb.
L%	y coordinate of X-15.
D%	Change in L% determined by up/down keys.
I%,C%	Pointers to X-15 string.
E%	Screen memory location of X-15.
B%,T%	y direction coordinates of the upper (lower) most piece of landscape at the bottom (top) of the right hand side of the screen.
N%	Usually a random number.
RX%,RY%	x and y coordinates of robot planes.
RT%,RB%	Minimum and maximum y coordinates for robot planes.
RL%	Robot plane launched flag.
MX%,MY%	x and y coordinates for SAM.
MT%	Maximum y coordinate for SAM.
ML%	SAM printed on screen "ready to be fired" flag.
MF%	"SAM fired" flag.
SC%	Score.
HI%	High score.
NP%	Number of X-15s.
OV%	"Game over" flag.
J%,K%,Z%,R%	INKEY numbers for up, down, bombs and rockets.
A%	Pointer to look up table of integers DIV 3.
S%	Pointer to string to be printed down right hand side of screen.
P%	Pointer to string representing X-15s.
HI$	Name of high score holder.
MU$	SAM going up string.
RU$,RD$,RH$	Robot plane going up, down and horizontally.
D$	Rocket string.
C$	Piece of city string.
X$,Y$	Small explosion strings for rockets and bombs.
B$	Blank string.
R$	Bomb string.
P0$,P1$	Two sets of X-15 strings to get rocket exhaust effects.
E$	Big explosion string.

By DAVID PILLING



X-15 listing

```
   10 REM ========================
   20 REM
   30 REM   X-15
   40 REM   By D. J. Pilling
   50 REM   (C) The Micro User
   60 REM
   70 REM ========================
   80 PROCc
   90 PROCs
  100 MODE7
  110 PROCi
  120 MODE2
  130 PROCscs
  140 REPEAT
  150 PROCgs
  160 REPEAT
  170 N%=RND(3):SC%=SC%+100
  180 IFN%=1PROCgrs:REPEAT PROCsc:PRO
Cg:UNTILW%=252 ELSEIFN%=2 PROCts:REPE
AT PROCsc:PROCt:UNTILW%=252 ELSE PROC
cis:REPEAT PROCsc:PROCci:UNTILW%=252
  190 UNTILOV%
  200 PROCge
  210 UNTIL FALSE
  220 END
  230 DEFPROCsc
  240 L%=L%+D%
  250 IFI%=P% I%=I%+30 ELSEI%=P%
  260 IFINKEYK% C%=I%+8:D%=1:E%=E%+67
2 ELSEIFINKEYJ%ANDL%>2 C%=I%+19:D%=-1
:E%=E%-608 ELSEC%=I%:D%=0:E%=E%+32
  270 IFE%>&7FFF E%=E%-&5000 ELSEIFE%
<&3000 E%=E%+&5000
  280 IF?E% PROCexp:ENDPROC
  290 O%=O%+32:W%=W%+4
  300 IFO%=256O%=0:U%=U%+1
  310 IFW%=256W%=0:V%=V%+1
  320 IFU%=&80U%=&30:V%=&6
  330 IFF%PRINTTAB(X%,Y%)" ":IFX%=18F
%=0
  340 ?&350=O%:?&351=U%
  350 *FX19
  360 VDU23;12,V%;0;0;0;23;13,W%;0;0;
0;
  370 PRINTTAB(4,L%)$C%TAB(19,0)$S%;
  380 IFF%ELSEIFINKEYR% X%=7:Y%=L%+D%
:F%=E%+32:SOUND1,1,200,20 ELSE440
  390 IFF%>&7FFF F%=F%-&5000
  400 IF?F%PROCx(?F%AND170,X%,Y%):GOT
O440
  410 F%=F%+32
  420 IFF%>&7FFF F%=F%-&5000
  430 IF?F%PROCx(?F%AND170,X%+1,Y%) E
LSE F%=F%+32:X%=X%+1:PRINTTAB(X%,Y%)D
$
  440 IFG% ELSEIFINKEYZ% H%=L%+1+D%:G
%=7:M%=E%+1312:SOUND2,2,150,15:ENDPRO
C ELSEENDPROC
```

Turn to Page 146

PROCEDURES

PROCsc	Moves X-15 in response to up/down keys (line 260), checks for impact with anything (280), does scrolling (290-370), sorts out rocket movement (330 and 380-430) and dropping bombs (440-490).
PROCx(N%,X%,Y%)	Used when the rockets have hit something. N% is the contents of the screen memory at the next position of the rockets (X%,Y%). Checks to see what has been hit. Increments score accordingly. Resets rockets and prints explosion.
PROCy(N%,X%,Y%)	Repeat of PROC but for bombs.
PROCts	Set up for a tunnels section.
PROCcis	Set up for a city section.
PROCgrs	Set up for hills section.
PROCg	Generates hill landscape. Line 740 produces asteroids and line 770 fuel dumps. Line 750 uses PROCru to control robot planes. Rest procedure generates jagged scenery.
PROCru	Makes robot plane home in on the X-15 while ensuring that it does not demolish landscape.
PROCmu	Aims the SAMs at the X-15. Handles the movement of the SAM stopping movement when SAM reaches maximum allowed height or when there is no chance of it hitting X-15.
PROCci	Generates city landscape with SAMs, bases and asteroids.
PROCt	Produces tunnels with fuel dumps and asteroids.
PROCc	Defines characters and envelopes. Initialises score variables.
PROCs	Constructs the strings for the game.
PROCexp	Somebody just wrote off an X-15, so generate suitably big explosion.
PROCgs	Initialises variables at the start of game. Sets up the on screen colours with VDU19s.
PROCge	Called at the end of each X-15. Tidies things up, clearing sounds, decrementing number of X-15s. If no X-15s left calls PROCgx.
PROCgx	Displays "game over" screen. States if high score beaten and if so prompts for input of player's name.
PROCscs	Start of game screen. Shows X-15 over sea, displays scores, waits for Return to be pressed to start game.
PROCp	Produces animated X-15 in PROCscs.
PROCd(T%)	Gives a delay of T%+1 centiseconds.
FNGK	Return the -ve. INKEY number of a key held down. Prompts for the release of the key.
PROCi	Prints title page and instructions. Defines which keys control things.
PROCsx	Produces some computer type bleeps.

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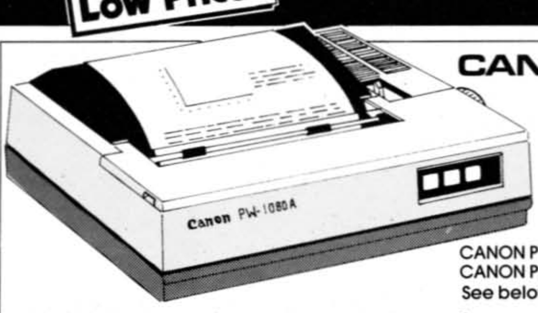

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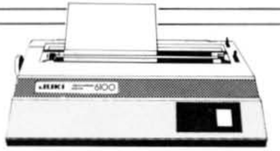

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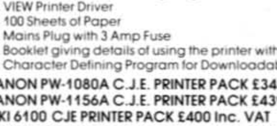

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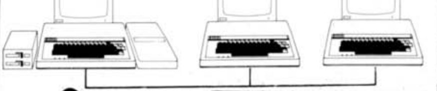

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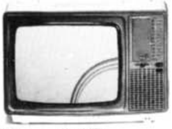

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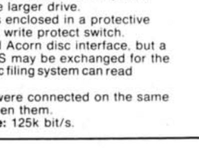

The Micro disc drive offers a method of low cost quick access to programs. The drive is essentially a small version of a 5¼" disc drive and offers similar features to the larger drive.
The data is stored on a 3" disc, this is enclosed in a protective hard plastic cassette which features a write protect switch.
The micro drive requires the standard Acorn disc interface, but a new disc filing system rom. Acorn DFS may be exchanged for the micro DFS for £2.30. The new micro disc filing system can read and write to Acorn DFS discs.
Thus if a 5¼ inch and a micro floppy were connected on the same cable files could be transferred between them.
Capacity: 80.64 K bytes **Transfer Rate:** 125k bit/s.

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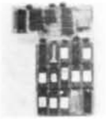
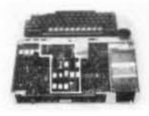
SIDEWISE



SIDEWISE FITTED



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No soldering required **£33.44** + **VAT**

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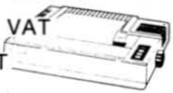

RX-80FT £212.00 + VAT
FX-80 £315.00 + VAT

Printer Pack **includes** paper & BBC cable **£7.00** + VAT
Screen dump rom available for **£10.00** + VAT

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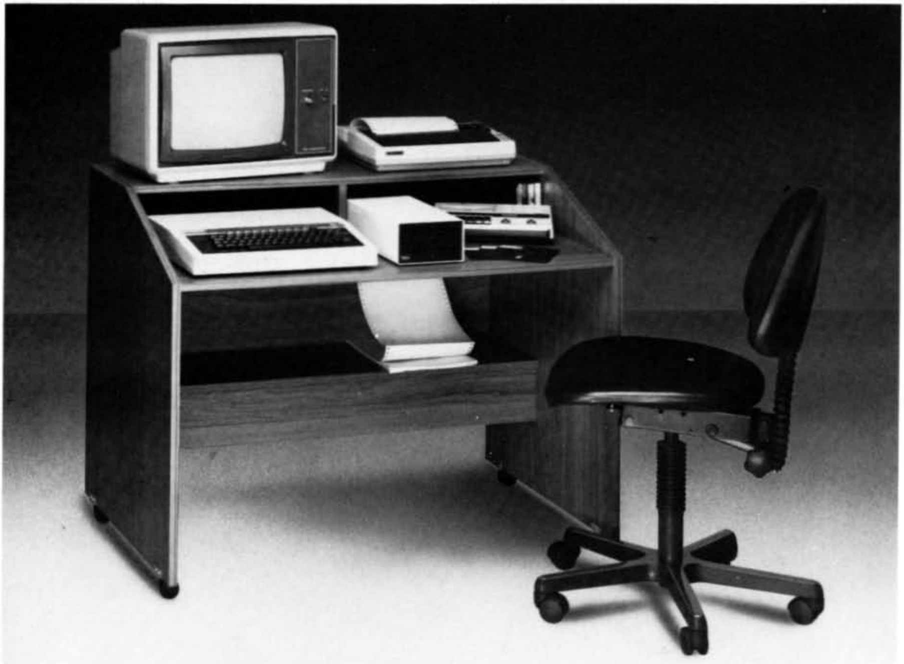

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NEW
16k EPROM

***HEX,** Is a full HEX dump, displaying 8 bytes of HEX and ASCII equivalent per line. A status line shows the current address and the byte at this address in:- HEX, ASCII, Decimal and either the binary, basic token or assembler mnemonic. Forward and reverse scrolling of the display at normal and high speeds is a feature, as is a full on screen memory editing facility which allows inputs in either hexadecimal, ASCII characters or assembler mnemonics.

***MON,** Serves the same function as *HEX, but the display is in disassembled opcodes, rather than *HEX. The editing and scrolling facilties are the same as for *HEX. An additional feature of *MON is the ability to directly follow JSR's, branch's etc.

***DEBUG,** A full featured program debugging aid, allowing the programmer to see the most intimate details of the program under examination. Features, variable speed, single stepping, breakpoints, continuously updated disassembler, selective HEX dumps (up to 6) plus current stack, all continuously displayed on screen, plus many other features.

***DISCED,** A comprehensive disc sector editor enabling any sector of a disc to be read, inspected, edited and written back. It will work with any 40, 80 or dual formatted single density disc.

***DGET,** Searches a disc for all occurances of a string or group of bytes.

***REL,** Enables machine code to be easily moved around in memory, automatically adjusting JSR's, JMP's etc.

***SLOW,** This command causes the entire computer to slow down to any variable speed between 1 and 255. This can allow the in depth study of graphic's methods etc.

***EDIT,** A dynamic basic screen editor, cursor controlled with full forward/reverse scrolling of listing, incorporating insert/delete lines, insert/overwrite characters, enter line from any position after editing.

"No need to Sweat!
Let me be your slave."

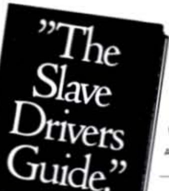
***REF,** Produces a cross reference listing of the current basic program. All variable names are listed (WITHOUT HAVING TO RUN THE PROGRAM!) in alphabetical order followed by the line numbers on which they are referenced. Numeric items can also be crossed referenced if desired.

***SORT,** A built in sort routine allowing any single dimension array, be it integer, real or string, to be sorted.

BASIC COMMAND LIST:-
*PROG, *BAD, *EXTEND, *PACK, *SORT, *PAGE, *ENVELOPE, *FIND, *REPLACE, *XREF, *TRON, *TROFF, *CHAR, *EDIT, *EDKEY.

MACHINE CODE COMMAND LIST:-
*MCODE, *MOVE, *CROM, *SLOW, *GET, *PHEX, *GO, *MON, *HEX, *SPACE, *DGET, *DISCED, *DIS, *DEBUG, *CRC, *REL.

Designed with the serious programmer in mind, a 16K Eprom packed with a multitude of programmer friendly utilities, as with all SLAVE'S, SLAVE is instantly available and will obey an extensive range of commands. So why not invest in more muscle for your BEEB, and get some help with the heavy work!!! SLAVE has over 30 comprehensive machine code and basic tools.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Slave is available direct from A&F Software Ltd for only £49.95. This includes post, packing, VAT, and User Guide.

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A notable composer that's hard to beat

GABRIEL JACOBS tests an extremely user-friendly music synthesiser package

UNLESS you are in the music business, and in some cases even then, or contemplating producing full orchestral scores, Island Logic's Music System will give you most of what you'll need for your compositions and arrangements – and a great deal of fun too.

It's a piece of integrated software which provides a flexibility and a range of features not available in any other music package for the BBC Micro at a comparable price (£24.95).

On top of this it's about as friendly and docile as could be, though its maximum potential can only be realised by those who know something more about music than playing the comb and paper – despite Island's claim in its advertising copy.

The program comes on a single disc – a double cassette version is available, though it's not quite as powerful – and there is a second disc containing a library of tunes and ready-made sound envelopes.

The system disc contains five interlinked modules. Heart of the package is the input Editor, which uses the BBC's normal three voice (melody) channels plus the percussion channel.

It has a range of four octaves, and includes a broad spectrum of notes, rests, key and time signatures, tempi and musical symbols (including accidentals, ties, repeat signs, 1st and 2nd time bars and so on).

Music is entered directly, one voice at a time, and immediately displayed in standard notation on treble and bass staves. It can be played back when required, in single or multiple voice, from the beginning of a tune or from the cursor position.

The Editor has been provided with a sizeable array of control facilities – insert, delete, re-form bar lines after editing, search, copy or erase blocks, and many more.

An obedient macro utility handles global replacements in volume, pitch and sound envelopes. To take a simple example, you can accentuate the first beat of every bar in your composition in a single operation.

A tune can be instantly transposed into any key, with automatic recalculation of accidentals, including double sharps and flats, and an "autobar" routine which can be toggled off generates bar lines dynamically at input.

With the Synthesiser you create sets of sound shapes in the form of envelopes which can then be incorporated into the voice lines.

New sets can be made up from parts of previously created files, and the envelopes can be saved in BBC format for your own Basic or machine code programs.

Pitch, amplitude, modulation and frequency are handled either by setting the 19 parameters from the Parameter Screen, or by on-screen editing of an impressive display of matched frequency and amplitude graphs.

Attack, sustain, decay and release can be manipulated with a minimum of fuss, and set with variable rates of change to produce a wide variety of sounds.

The percussion line is serviced by various pre-set rattles, clicks and crashes, but you aren't limited to them, or even to a single percussion line, since percussive envelopes can be used in the voice lines. So it's possible to simulate a complete drum kit.

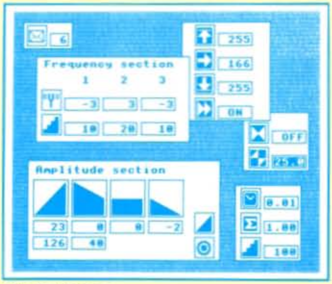
The effects which can be obtained with the Synthesiser module only serve to spotlight the lack of an audio output on the BBC. However if your machine is wired up to a hi-fi system quite spectacular results are possible.

As with all attempts to turn a qwerty keypad into a piano, the Keyboard module takes some getting used to, but once you're familiar with it, it becomes an effective tool. Basically it's a secondary, realtime input routine which emulates on screen not only a piano keyboard, but also a four-track tape recorder with standard playback, record, fast forward and rewind functions.

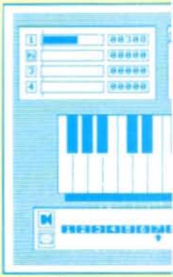
The Keyboard is handy for experimenting with ideas which can later be committed to the Editor, but primarily it complements the Synthesiser by using envelopes to imitate, as you play, the sounds of conventional musical instruments (within the limits of the hardware – don't expect actually to fool anyone).

A set of default envelopes is loaded with the Keyboard, but new sets can be called when desired.

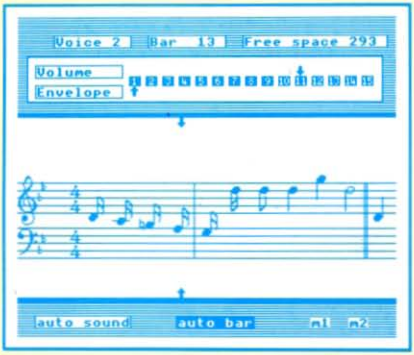
Lines are recorded independently, then played back as others are being keyed in, while a variable background metronome beat holds the tempo steady. And there is a pause facility on

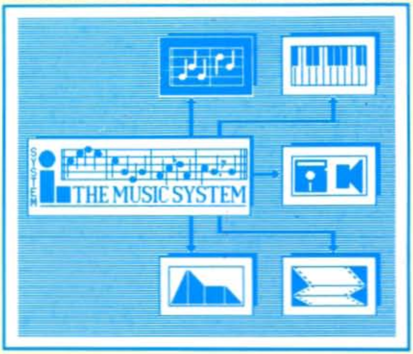


The Synthesiser



The Keyboard





Above: Control screen
Left: The Editor

the tape recorder which is useful for practising small sections of music before recording them.

Linker allows for mid-tune key, time and tempo changes by joining together, in any sequence, up to 10 previously-saved music files, plus up to six repeats of any of them.

The Printout module produces very acceptable hard copy, with vertically drawn staves, on an Epson RX, FX or Star Delta printer (other printers will be supported soon, according to the instruction manual).

Since the printer driver is sending bit-image data, output is slow, but drafts can be taken in low resolution mode up to three times faster than its hi-res equivalent.

Draft printing can also be speeded up by opting not to align bars between staves. You get a more compact output, but it looks less like a typeset score.

Given the care and attention to detail that have gone into producing the package, it's rather surprising that there's no provision in the Printout module for automatic page ejects.

The only way to paginate is to create files which will just fill one page, and with varying bar lengths this can be very tricky.

I can't believe it would have been all that difficult to include a routine which took page length into account and drew a double bar line before a break.

In all the other modules, however, the package has been written to make life as comfortable as possible for the user.

Excellent internal file management and error trapping make it virtually idiot-proof. And a superb system of user selection by highlight, high speed icons, and overlapping pop-up windows always makes you feel at ease with the program.

The quality and use of graphics from start to finish is beyond criticism.

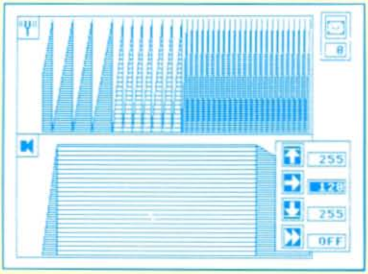
The instruction manual is all lean meat, clear and well-structured, quite an achievement given the complexity of the content. And a double-sided function key strip usefully completes the documentation.

Having said all that, I should stress that the problem of pagination when printing is not the only functional limitation of the program.

For instance, alto and tenor clefs are not catered for. You can't have joined quavers, semiquavers etc, as they would normally appear in a musical score. And there's no provision for dealing with lyrics or marks of expression.

Nor do the Synthesiser and Keyboard modules measure up in every respect to some of their dedicated competitors. But it's hardly fair to compare them with something like Acorn's Music 500, a hardware/software combination priced almost an order of magnitude higher than The Music System.

My view is that Island's design team set their targets more or less right. Only the most nitpicking of critics could ask for much more in an all-purpose, readily-usable and affordable package.



The Synthesiser

Any improvement on Britain's No. 1 word processing ROM...

WORDWISE was the very first ROM based product to be made available for the BBC computer and over the last couple of years it has become the most popular word processing system for the BBC machine with almost 50,000 chips now sold.

It has consistently received excellent reviews for its ease of use and speed. It takes only minutes for the user to become familiar with a powerful professional word processing system.

An introduction to Wordwise Plus
Wordwise Plus
Wordwise Plus

WORDWISE PLUS is now available extending the original program in many unique directions. Not only is the program now twice the size but the package includes two completely new manuals—an introductory manual that gently introduces the newcomer to word processing with WORDWISE, and a reference manual listing all the commands.

THE WORDWISE PLUS PACKAGE CONTAINS

1. **16K ROM**
2. **SPIRAL BOUND REFERENCE MANUAL (180 pages)**
3. **INTRODUCTORY MANUAL (56 pages)**
4. **KEYSTRIP**
5. **TYPING TUTOR PROGRAM (On cassette)**
6. **EXAMPLE TEXT (On cassette)**
7. **EXAMPLE PROGRAMS enabling mail merging, index generation, etc.**

WORDWISE PLUS is completely compatible with all older versions and is able to use existing WORDWISE files without modification.

WORDWISE PLUS FEATURES

Over the last couple of years we have received countless suggestions for ways of extending or adding new facilities to WORDWISE. It soon became obvious that we would not be able to implement every single suggestion. Indeed, each person uses a word processor in a different way—each individual has differing requirements—a feature that one person may think essential another may have no need for.

We have overcome this problem in two ways. Firstly we have included the most commonly requested additions and improvements. A number of new editing features and a few more embedded commands have been added.

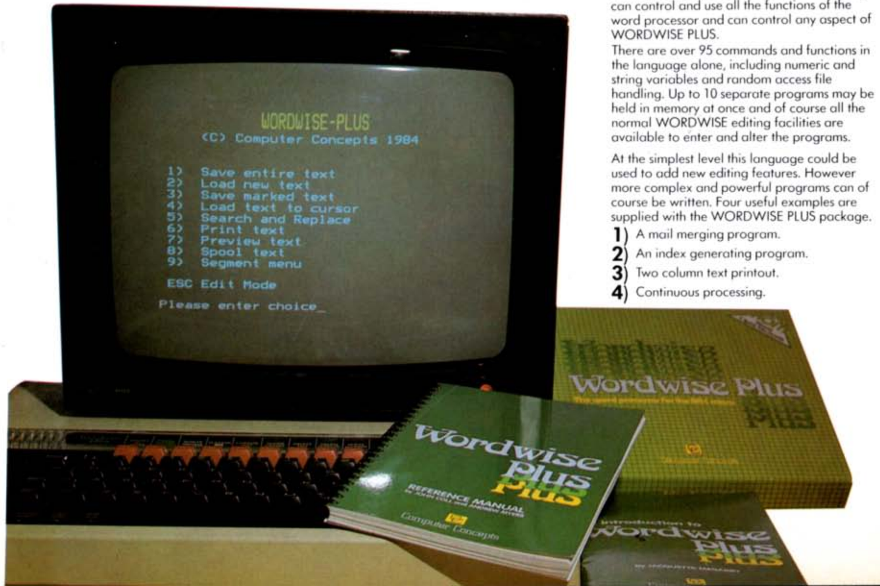
Secondly a unique BASIC-like programming language has been incorporated. This facility enables the capabilities of this word processor to be extended in an infinite number of ways.

The language itself has been designed, like WORDWISE, to be simple to use and understand. Many of the commands look and act like BASIC commands and so will be familiar to many users. However the language can control and use all the functions of the word processor and can control any aspect of WORDWISE PLUS.

There are over 95 commands and functions in the language alone, including numeric and string variables and random access file handling. Up to 10 separate programs may be held in memory at once and of course all the normal WORDWISE editing facilities are available to enter and alter the programs.

At the simplest level this language could be used to add new editing features. However more complex and powerful programs can of course be written. Four useful examples are supplied with the WORDWISE PLUS package.

1) A mail merging program.
2) An index generating program.
3) Two column text printout.
4) Continuous processing.



```
WORDWISE-PLUS
(C) Computer Concepts 1984

1) Save entire text
2) Load new text
3) Save marked text
4) Load text to cursor
5) Search and Replace
6) Print text
7) Preview text
8) Spool text
9) Segment menu

ESC Edit Mode

Please enter choice_
```

...Must Be A Plus

Word Processing With Wordwise

All the advantages of a ROM—instantly available. One command and your BBC machine becomes a powerful word processing system.

Fast and very simple to use.

The more complex commands are menu driven, enabling those totally unfamiliar with this software to use these more powerful features straightaway.

The function keys are used to full effect with a keystrip clearly showing each function.

Block copies and moves. It is possible to mark any part of your text, this marked section may be instantly moved or copied to any other part of your text. This cut and paste type of operation is a vital part of all word processing operations and with WORDWISE it is simplicity itself.

Automatic headings, footings and page numbering. When printing a document many pages long it is possible to have WORDWISE number the pages for you and put any heading or footing line on each page.

Unique word counting feature. Ideal for journalists, it constantly displays the current number of words typed. It also allows word counting for specific sections of a document.

Works with all filing systems, such as DISC., CASSETTE., and the new ADFS. Works with any printer that works with the BBC machine (most do) and is able to access the special features of any printer (italic, subscripts, etc.). There is no need to buy additional printer driver programs.

Here are a few of the things that have been said about WORDWISE.

"WORDWISE offers an extremely user friendly program . . . it would make an excellent choice for someone rather apprehensive about word processing."
. . . E & CM

"WORDWISE has won a devoted fan club because of its flexibility and ease of use."
. . . Practical Computing

"On the whole WORDWISE is an excellent wordprocessor . . .WORDWISE is thoroughly recommended."
. . . VIEWFAX 258

"WORDWISE is straightforward, friendly and excellent value."
. . . Practical Computing

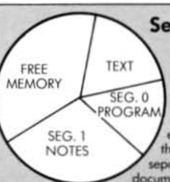
". . . it is ideal for the home hobbiest and small businessman."
. . . A & B Computing

Word Processing with Wordwise Plus

WORDWISE PLUS still has WORDWISE as its core therefore it is still very user friendly and retains all the features that made WORDWISE the most popular word processor. It now has many new additions making this the most flexible word processor yet.

WORDWISE will continue to be sold alongside WORDWISE PLUS. For those more specialised users who require the added flexibility here are a few of the new features.

Segments



When using WORDWISE PLUS, the BBC's memory is divided between your text and up to 10 'segments'. Each segment may contain either a program or just normal text. It is therefore possible to store and edit up to 11 separate documents in memory, or 1 document and 10 programs, or any mixture.

Often when writing letter or articles it is useful to keep a notepad, outlining what you intend to write. In WORDWISE PLUS one of the segments could be reserved for an electronic notepad. It would be a simple matter to switch your 'notepad' and your main document with just a single key press.

Some of the New Editing, Embedded Commands and Wordwise Extensions

WORDWISE PLUS works with the 6502 2nd processor. This allows more text to be stored in memory and 80 column previewing no matter how full memory is.

New embedded command FI will fully indent text against the right margin.

New commands for underlining and bold printing. The bold and underline effects are shown on screen—and it is a simple matter to configure these features for any printer.

Saving and loading of text is now up to 10 times faster on disc, and now the computer gives the user a warning if a document is going to be overwritten on the disc or in memory.

There is now a working filename—i.e. WORDWISE remembers the name of the current document being worked on.

New command deletes markers automatically.

It is now possible to print or preview a file directly from disc without having to load it first.

New embedded command 'PS' allows strings to be inserted into the text when it is printed.

New embedded command 'PF' will read a document from file when printing and interpret any embedded command in that file.

Improved search and replace facilities now include wild-cards.

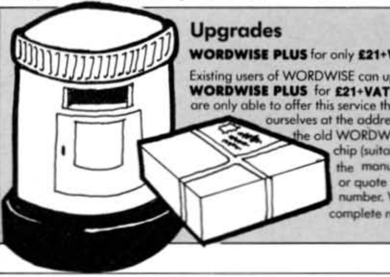
Example Programs Supplied With Wordwise Plus

1) A mail merging program that allows names and addresses to be added to a standard letter. This is a relatively easy job with this language.

2) An index generating program. This finds keywords and generates a separate index listing the word and the page numbers where the keywords occurred.

3) Two column printout. This program will print your text in two columns across the page.

4) Continuous processing. This enables the disc user to process and edit extremely large documents spread over several files as if it were one continuous document in memory.



Upgrades

WORDWISE PLUS for only **£21+VAT**

Existing users of WORDWISE can upgrade to **WORDWISE PLUS** for **£21+VAT (£24.15)**. We are only able to offer this service through ourselves at the address below. Please return the old WORDWISE package complete with chip (suitably protected for postage) and the manual with your cheque or P.O. or quote your Access or Barclaycard number. We will then send you the complete new package.

In The Near Future

HI-WORDWISE for 2nd processors that allows even more user memory, supplied on disc for less than £5 to WORDWISE PLUS owner.

A FAST SPELLING CHECKING PROGRAM.

Both WORDWISE and WORDWISE PLUS are available from all good computer dealers. Alternatively you can obtain these directly from Computer Concepts.

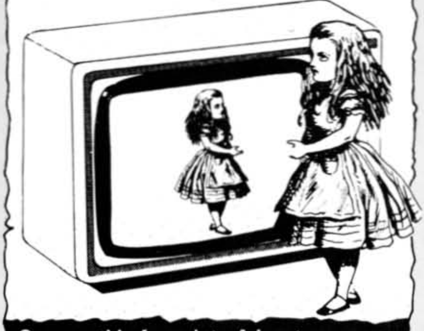
WORDWISE PLUS £49+VAT (£56.35)
WORDWISE £39+VAT (£44.85)

Computer Concepts

Computer Concepts, Gaddesden Place,
Hemel Hempstead, Herts HP2 6EX
Telephone: (0442) 63933

VISA

Alice through the VDU



Our monthly foray into Adventure games

Acornsoft collects the five star prize

JON Thackray is a Cambridge mathematician who, along with Conway (inventor of the computer game of Life) et al enumerated the sporadic group J4 in 1980.

Now he, together with colleague D. Seal has produced Acheton, a massive disc based adventure from Acornsoft. I wonder which achievement he'll be remembered for . . .

Group theory developed from attempts to solve equations. How to solve cubic and quartic equations algebraicly was revealed in 1575 by Cardan and his brilliant secretary Ferrari. We know very little about Ferrari except that he had a dangerous temper (he lost some fingers in one fight) and even Cardan, not averse to knifing the odd person, was afraid of him.

Nevertheless Ferrari was intensely loyal to Cardan, who gave him the full credit for showing how to reduce the quartic equation to a cubic which can then be reduced to, and solved as, a quadratic.

For the next 300 years mathematicians attempted to reduce (hence solve) the quintic equation. This was eventually shown to be impossible by Abel, a Norwegian, and Galois in the early 1800s. Norwegians seem very unlucky with their discoveries since Galois, a Frenchman, is the better known because he wrote his proof the night before he was fatally shot in a duel at the age of 20.

What Galois showed, very simply, is that no matter how you manipulate or substitute the general quintic equation, you always come back to a quintic. Many things behave in this manner – an example is the Rubic cube which has only two groups. If assembled randomly there is only a 50:50 chance it can be solved.

Group theorists had great fun with this "toy", but the subject has had its greatest impact in models of fundamental particles – the quarks and hadrons.

Thackray has obviously also played around in Colossal Cave so now you know whey he has called one room J4. Although saying 86,775,571,046, 077,562,880 (or PLUGH) has no effect at J4 knowledge of Colossal will help you through some of the problems.

Yet again, plants need watering, keys must be found, mazes mapped in different ways and logical connections made (although why Florence Nightingale should be in a single level Hades is a real puzzle, but then you don't start in the Wood of Errors (see The Divine Comedy by Dante).

The game comes on two discs and is massive – 350 rooms with a corresponding number of puzzles (some large games have very few puzzles whereas Killworth crams many puzzles in relatively few rooms).

However the really interesting feature of the package is that one disc – the database – contains the room descriptions while the other has the program to drive the database plus an enormous set of hidden hints.

This may appear a simple, even obvious, idea to prevent the player seeing answers to problems he has yet to encounter, but giving him only the information he requests is a difficult though very interesting exercise – particularly when real security is involved.

One simple answer would be to make the adventure "linear", that is there is essentially only one progressive path, through many obstacles, from the start to the final problem. Each obstacle, on solution, gives a password which can be used to reveal hints or the solution to the next one. Such a design would only reveal the right information.

Unfortunately such a design is very restrictive, so the authors, quite rightly, trust the player not to cheat himself. You get a printed set of questions that you can ask about various objects, creatures and locations. For example you can ask what to do with the mushroom – a well known psychedelic treat for some of us.

In order to see as much as possible I immediately read the list – and it doesn't give away very much. How it works is that if you really want to know about mushrooms then you type in the given number and the program gives a set of increasingly revealing hints until, with a warning, it gives the full answer.

Apart from the hints it can also tell you where to find all the treasures (there are over 50) and what their uses are. Where they are is meaningless until you have explored the caves so again security is good. It is usually obvious what an object is, but I cannot find any dictionary which contains "palantir".

As you play the game your current location is shown at the top of the screen, plus a score that rises if you progress and falls if you are on the wrong track. For example, there are two ways into the cave, but you'll probably only find the correct entrance after using the wrong one.

This is a very carefully designed game with great appeal to us reactionaries who prefer lots of cleverly combined puzzles presented in black and white text – words expand the imagination whereas pictures often restrict it. Someone once said that words often convey more than we mean, being ripples that can cause waves.

If you liked Colossal Cave or getting the point BLACH in Philosophers Quest then this will keep you quiet for a few months. You can usually rely on Acornsoft for a good game, but this is five star.

* * *

If you, like Thackray, enjoy mathematical puzzles on computers you will probably go for Micro-Maths by K. Devlin (Macmillan). This book is a collection of articles written for the Guardian newspaper (with the spelling corrected) and covers many of the most famous number theory problems such as evaluating PI (to 10 million places), searching for prime numbers and factoring non-primes, Archimedes' Oxen Problem and Fermat's Last Theorem – both Diaphantine problems – plus a few apocryphal stories.

One story (opposite "True beyond reasonable doubt") concerns the origin of the term "de-bugging" since it is "well nigh impossible to write a program of more than [6] lines (if that)" without making an error. This reveals that Devlin is *not* a professional computer programmer since he then defines such errors (bugs) as the cause of "mysterious, bizarre results".

Most professionals, like artists, design "top down" – the structure is vastly more important than the details. When the design is coded errors are expected to occur, but the real concern is tuning the performance. Bugs are rarely mysterious and removed, by the professional, without difficulty.

The story is apocryphal. Invented by Commander Grace Hopper of the US Navy (and designer of Cobol) it was actually an in joke about her name. I never believe stories people tell about themselves – that includes myself, Peary at the North Pole and Christ meeting the Devil. Hearsay from independent sources is usually nearer the truth, so I do believe Amundsen was first to "box" the South Pole.

MP
SOFTWARE
THE VALLEY OF THE KINGS
ADVENTURE
BBC B

The demerits of the book are that it is a jumble of interesting odds and ends with little indication of how to find further information. Also many of the problems are ancient history. Maybe Marshall Cavendish could bring out a series on Great Mathematicians and their Discoveries. Their doings are just as interesting as composers and artists and the subject is equally universal

A book I would like to see would deal with famous computer problems and personalities, a far more recent development. One such problem is called the Polish Firing Squad, Polish because they are very simple minded.

You have a line of N soldiers and each soldier can only see the "state" of his immediate neighbours left and right. The two end soldiers have only one neighbour.

On giving a start command to one end of the line the problem is to coordinate the soldiers so that they all fire together. The soldiers all have the same set of instructions which tells them, at fixed intervals, to observe the "state" of their neighbours plus their own "state" and, from this information, to assume another "state" – they are, in effect, obeying a set of cards similar to the Dropping Bricks problem.

The problems are to construct the minimum number of "states" or cards and find the minimum time required to coordinate the line of soldiers. The time, first found by E. Goto, is 2*N-2 and the minimum number of cards was later found to be nine. I invite the reader to consider the problem.

The Valley of the Kings,

by MP Software

BASICALLY three pyramids to plunder, the main treasure being a golden mask. I'm losing my touch partly because I didn't read the instructions carefully (you can go LEFT and RIGHT) or look at the pictures on the insert.

Consequently I spent some time digging in the car and on the shoulder of the statue plus trying to break out of the first pyramid to the right.

The game does need a few hints but I used MZAP to look at the verbs and objects – some useful verbs are TIE, RUB, REMOVE and THROW. If you are hungry look for JAM.

All the words can be reduced to four letters so other useful objects are SARCOPHAGUS (or SARC) and GASMASK (or GASM).

MP
SOFTWARE
ADVENTURE

Sadim Castle,

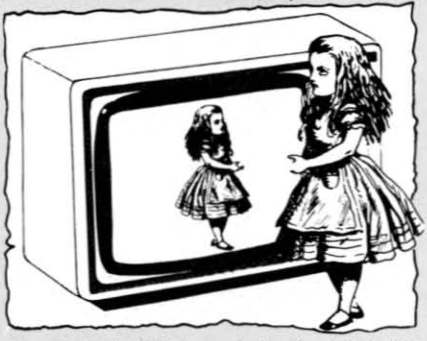
by MP Software

THIS will please you – I haven't got past the wine cellar. If you haven't got that far then drink at the spring and shift the statue – you don't need a SPAD this time.

Both games are small, unassuming and well protected – the easy days of listing out a Basic program have gone. As people are still telling me how to kill the dragon in Twin Kingdom Valley I anticipate a year of being told how to give the Lady Leonora Sadim a decent burial.

Meanwhile I consign her below Ugolino to the frozen centre of Hell where Lucifer gnaws on Brutus, Cassius and Judas Iscariot. Turn LEFT at Lucifer's waist all ye who enter there.

Remember the Monkeys and Coconuts problem?



THERE is no solution to the Monkeys and the Coconuts problem.

Before I get Angry Person letters I consider it fair to set such problems (Acheton is full of things you can't or shouldn't do). The hints were Diaphantos and a mention of Fermat's Last Theorem, which is conjectured to be impossible also.

The "solution" was therefore to show that no integer can satisfy the problem of the five men cheating at night followed by a fair split with the three monkeys in the morning.

Proof: The fifth man must leave a pile divisible by 8 – call it 8*N. Therefore the 4th man left (8*N)*5/4 + 3 = 10*N + 3 which must be an odd number – call it Nodd.

Therefore the 3rd man left Nodd*5/4 + 3 which is impossible since Nodd*5 must be odd and therefore indivisible by 4.

In fact whenever (5 men + M monkeys) is a multiple of 8 (M=3, 11, 19...) there is no solution but, surprisingly, there is always a solution otherwise (I have a truly marvellous program to show this but cannot fit it into the article).

An interesting situation occurs when there are 1023 monkeys. In this case the initial pile = 11,533 coconuts and the final totals are 2103, 1478, 978, 578, 258 for the men and only 6 each (the minimum) for the monkeys. Actually the men are not really cheating because they invest (plant) their profits to grow more economic palm trees and therefore only got one coconut each (sad, isn't it?).

This makes the tax man happy (he has to tax the masses) and stops the monkeys' union from working uneconomic palm trees in the awkward parts of the island.

Problem

AN example of a group problem was the Filthy Fifteen Prisoners. Although there are thousands of permutations there are only seven "groups" of solutions.

A similar problem is to place eight queens on a chess board so that no queen attacks another. Here there are 12 "groups" of which 11 have no reflection or rotation symmetry and one group which can be rotated 180 degrees back to the same position, namely C1 E2 B3 H4 A5 G6 D7 F8. Therefore the total number of solutions is 11*8 + 1*4 = 92.

Placing N queens on an N*N board has been investigated up to N=16 (this has 1,846,955 groups giving a total of 14,772,512 solutions). These results were obtained by computer programs that "back track". That is, whenever they cannot place another queen they treat this as a dead end in a maze and return to the last choice (or crossroads) and try another path. You do this when you draw a map in an adventure.

In order to illustrate back tracking I have written another prisoner problem. This time there are 21 prisoners and you must send them out each day in groups of three. Each group is chained together with two pairs of manacles thus X <–> Y <–> Z.

The prisoners refuse to be chained directly together for more than a day and the problems are:

- How many days can you keep them happy?
- Give a solution for the maximum number of days. Use the letters A-U.
- Ignoring permutations, what is the total number of solutions?

The best approach is to analyse the problem on paper and only use the program to test your answer. If you make an input error then enter 0,1,1 to clear the current day's entries and enter 0,0,1 to back track to the previous day.

Further modification can make the program select and back track automatically – an exercise I leave to the reader.

Alice

```
 10 DIM C(21,21),D(21)
 20 ON ERROR GOTO 150
 30 D(0)=1
 40 FOR I=1 TO 21
 50 FOR J=1 TO 21
 60 C(I,J)=0
 70 NEXT J
 80 NEXT I
 90 D=1
100 PRINT"DAY ";D
110 FOR I=1 TO 21
120 D(I)=0
130 NEXT I
140 FOR P3=1 TO 7
150 PRINT"GROUP ";P3;
160 INPUT" X,Y,Z ";X,Y,Z
170 IF X>0 THEN 260
180 PRINT"BACKTRACKING"
190 IF Y=0 AND D>1 THEN D=D-1
200 FOR I=1 TO 21
210 FOR J=1 TO 21
220 IF C(I,J)=D THEN C(I,J)=0
230 NEXT J
240 NEXT I
250 GOTO 100
260 IF X=Y OR Y=Z OR X=Z THEN PRINT
"Don't cheat":GOTO 150
  270 IF D(X)+D(Y)+D(Z)>0 THEN PRINT"
You can't do that":GOTO 150
  280 IF C(X,Y)>0 THEN PRINT"You did
";X;" and ";Y;" on day ";C(X,Y):GOTO
150
  290 IF C(Y,Z)>0 THEN PRINT"You did
";Y;" and ";Z;" on day ";C(Y,Z):GOTO 150
  300 D(X)=D:D(Y)=D:D(Z)=D:C(X,Y)=D:C
(Y,X)=D:C(Z,Y)=D
  310 NEXT P3
  320 D=D+1
  330 GOTO 100
```

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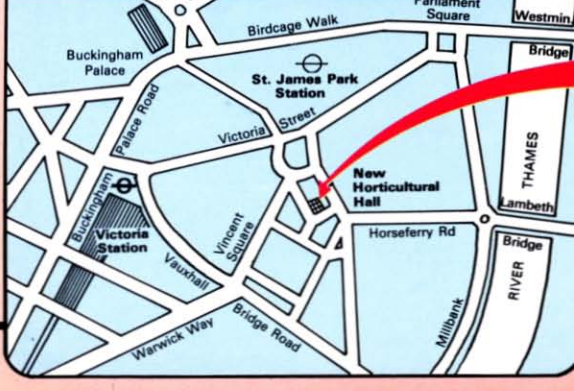
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Concluding MIKE BIBBY's introduction to programming

The trick with a database is to organise it so you get out more

WE investigated the Basic keyword LEFT$ last month and saw how we could use it to "slice off" a specified number of characters starting from the left hand side of a string.

Program I illustrates how it works. *loop%*, the loop variable, determines the size of each slice (line 10).

```
10 REM PROGRAM I
20 MODE 6
30 string$ = "0123456789"
40 FOR loop% = 1 TO 10
50 PRINT LEFT$( string$, loop% )
60 NEXT loop%
```

Program I

Can you remember what would happen if our loop went from 0 to 11 – that is from before the first character in *string$* to past the last?

Notice how the program gives us a triangle of numbers. As we've done before, let's turn the triangle upside down. There are two possible ways. We can replace line 40 with:

```
40 FOR loop% = 10 TO 1 STEP -1
```

Another way, though less obvious is to keep the original line 40 but to alter line 50 to:

```
50 PRINT LEFT$( string$, 11 - loop% )
```

Here we're subtracting from an offset of 11. So the first time through the loop, when *loop%* is 1, we take the 10 leftmost characters of *string$*, (11 – 1).

Next time through *loop%* is 2, so we take 11 – 2 = 9 characters, and so on.

This idea of taking the loop variable away from an offset can be extremely useful – you can have two indexes based on the loop variable.

The first *loop%* is the loop variable itself, and increases as the loop variable does. The second *offset% – loop%* decreases as the loop variable increases.

Don't worry too much about exactly how you'd use these techniques – now you've seen them, they'll come naturally to you when you need them.

We've covered LEFT$ in some depth now, and it won't surprise you to learn that there's a keyword called RIGHT$. It works exactly as you would imagine it would – as a sort of mirror image of LEFT$, slicing a specified number of characters from the right side of a string.

Program II illustrates RIGHT$. As you can see, it's virtually identical to Program I save that the reference to LEFT$ is replaced by RIGHT$.

I don't think we need to belabour the point, it's very similar to LEFT$.

```
10 REM PROGRAM II
20 MODE 6
30 string$ = "0123456789"
40 FOR loop% = 1 TO 10
50 PRINT RIGHT$( string$, loop% )
60 NEXT loop%
```

Program II

Remember that when you're using RIGHT$, the first variable inside the brackets specifies the string you're slicing. The second, numeric variable, tells you how many characters you want in that slice – starting from the right hand side.

If you want more practice with RIGHT$, use it to replace the occurrences of LEFT$ in last month's examples.

Now we can use LEFT$ and RIGHT$ to interrogate a database. Sounds fancy, doesn't it? Actually, it couldn't be easier. As we mentioned last month, a database is an organised set of records.

Here's the contents of the database we'll be using in our next example:

Tom	Smith
Paul	Jones
Dick	Brown
Jonathan	Johnson

Now the trick with a database is to organise it so that you get "more" information out than you put in!

In Program III, for example, we're going to read our four people's names into strings and then – using LEFT$ and RIGHT$ – have the program print out lists of first, second and full names.

Have a careful look at Program III. It's main part, the control section, is covered in lines 10 to 100.

PROCinitiate (lines 190 to 280) turns off the cursor (line 195) and dimensions the matrix for the strings, *name$* (line 200).

It also sets up *pad$* consisting of 10 spaces. We use this to make sure that each name, first or last, is exactly 10 characters long. We touched on this last month. The FOR ... NEXT loop of lines 220 to 270 does the work.

Line 230 reads in the first and second name into *first$* and *second$* respectively (the data is all on line 2000).

Lines 240 and 250 pad each of these characters out to a length of 10, then 260 concatenates them and stores them in *name$(loop%)*.

PROCchoice then gives you a menu to choose from, in the manner we discussed last month, and lines 60 to 90 take appropriate action, depending on your choice, which is stored in *choice$*.

PROCfull_names (lines 300 to 400) couldn't be simpler: for *loop%* equal one to four, you simply print out *name$(loop%)*.

However choosing the more friendly first names doesn't pose any problems

than you put in

for the micro, either. If you look at PROCfirst_names, you'll see that it's identical to PROCfirst_names, except that we print out:

```
LEFT$( name$( loop% ), 10 )
```

instead of simply:

```
name$( loop% )
```

The same goes for the more formal PROClast_names, except that this time, instead of LEFT$, we print out:

```
RIGHT$( name$( loop% ), 10 )
```

Easy isn't it? But notice how we did it. We set things up so we could make simple use of LEFT$ and RIGHT$ by carefully organising our database – padding out the names to 10 characters.

When you're writing a program to handle data it pays to have a good think about the form you're going to store it in. A little care in getting it into an easily manipulated form can pay dividends later.

Fine, we know how to carve the beginning (LEFT$) and ends (RIGHT$) off strings – but what if we want some characters out of the middle?

Well, we use the appropriately named MID$ to do that little trick. Take a look at Program IV.

The first point to notice about MID$ is that it has three parameters or variables inside the brackets.

The first variable defines the string we're going to slice – as it did with LEFT$ and RIGHT$. We're also

→

```
   10 REM PROGRAM IV
   20 MODE 6
   30 string$ = "ABCDEFGH"
   35 PRINT "The string is ";
string$'
   40 length% = 3
   50 FOR start% = 1 TO 5
   60 PRINT MID$( string$, start%,
length%)
   70 NEXT start%
```

Program IV

```
   10 REM PROGRAM III
   20 MODE 6
   30 PROCinitiate
   40 REPEAT
   50 PROCchoice
   60 IF choice$ = "1" THEN
PROCfull_names
   70 IF choice$ = "2" THEN
PROCfirst_names
   80 IF choice$ = "3" THEN
PROClast_names
   90 IF choice$ = "4" THEN END
   95 PRINT TAB(4,20) "Press Space Bar
to continue"
   96 REPEAT : dummy$ = GET$ : UNTIL
dummy$ = CHR$(32)
   97 CLS
  100 UNTIL FALSE
  110 REM ============================
  120 DEF PROCchoice
  130 PRINT ''"Do you wish to
list:-"'
  131 PRINT TAB(10) "1. Full names"
  132 PRINT TAB(10) "2. First names"
  133 PRINT TAB(10) "3. Last names"
  134 PRINT TAB(10) "4. End"''
  140 REPEAT
  150 choice$ = GET$
  160 UNTIL INSTR("1234", choice$)
  170 ENDPROC
  180 REM ============================
  190 DEF PROCinitiate
  195 VDU 23;8202;0;0;0;
  200 DIM name$(4)
  210 pad$ = STRING$( 10, " ")
  220 FOR loop% = 1 TO 4
  230 READ first$, second$
  240 first$ = LEFT$( first$ + pad$,
10)
  250 second$ = LEFT$( second$ + pad$,
10)
  260 name$( loop%) = first$ +
second$
  270 NEXT loop%
  280 ENDPROC
  290 REM ============================
  300 DEF PROCfull_names
  305 PRINT "The full names are :-"'
  310 FOR loop% = 1 TO 4
  320 PRINT TAB(10) name$( loop% )
  330 NEXT loop%
  340 ENDPROC
  400 REM ============================
  410 DEF PROCfirst_names
  412 PRINT "The first names are :-"'
  415 FOR loop% = 1 TO 4
  420 PRINT TAB(10) LEFT$( name$(
loop% ), 10 )
  430 NEXT loop%
  440 ENDPROC
  500 REM ============================
  510 DEF PROClast_names
  512 PRINT "The last names are :-"'
  515 FOR loop% = 1 TO 4
  520 PRINT TAB(10) RIGHT$( name$(
loop% ), 10 )
  530 NEXT loop%
  540 ENDPROC
  600 REM ============================
 2000 DATA Tom, Smith, Paul, Jones,
Dick, Brown, Jonathan, Johnson
```

Program III

From Page 93

familiar with the last variable – this tells us exactly how many characters we want in the slice.

It's the middle variable that's new, but it's fairly obvious when you think about it. With LEFT$ and RIGHT$, we knew where to start slicing our characters from (the beginning and end of the strings respectively), and we kept going until we had our required number of characters.

With MID$ we don't know where to start – all we've said is the middle of the string. We need to say exactly where in the string we want our slice to start from.

The second variable in the brackets does this, telling us the number of the character at which to start our slice. It then goes right from that character until it's of the required length (specified by the third variable). So:

```
PRINT MID$( "ABCDE", 2, 4)
```

would print out

```
BCDE
```

That is, it starts at the second character and prints out the number of characters specified – four. Notice, by the way, that the 2 and the 4 do **not** mean make the slice from character 2 to character 4, which would give you:

```
BCD
```

The 2 tells you the character to start at all right, but the 4 specifies the **length** of the string from there on – not the character you end on. Given this, Program IV should make sense to you.

```
   10 REM PROGRAM V
   20 MODE 6
   30 string$ = "ABCDEFGH"
   40 FOR length% = 1 TO LEN(string$)
   50 PRINT '"The string is ";
string$
   60 PRINT "The length of slice is ";
length%'
   70 FOR start% = 1 TO 5
   80 PRINT MID$( string$, start%,
length%)
   90 NEXT start%
  100 dummy$ = GET$
  110 NEXT length%
```

Program V

Program V uses nested loops to demonstrate the action of MID$ more formally. *string$* is set to ABCDEFGH (line 30) and we proceed to take slices of this.

The length of each slice *(length%)* varies in the outer loop (40-110) from 1 to the length of *string$*.

The inner loop (70-90) then shows the effect of using MID$ on *string$* for the specified *length%* starting successively at characters 1 to 5.

Each time through the outer loop the program waits for a key press (line 100) so you can see what's happening.

You should be used to nested loops by now; getting to grips with Program V should give you a real feel for MID$.

Oddly enough, one way we frequently use MID$ is to pick out a single letter from a string. We do this by setting the third parameter – which dictates the length of the slice – to 1.

For instance:

```
PRINT MID$( "ABCDE", 1, 1 )
```

will give us

```
A
```

while

```
PRINT MID$( "ABCDE", 2, 1 )
```

will give us

```
B
```

since the 2 tells us to start at the second character (in this case B) and to take a slice only one character long – so we simply have B returned.

```
   10 REM PROGRAM VI
   20 MODE 6
   30 INPUT "String", string$
   40 FOR loop% = 1 TO LEN( string$ )
   50 PRINT MID$( string$, loop%, 1 );
CHR$(32);
   60 NEXT
```

Program VI

Program VI shows how we can use this technique of picking out a single character to "spread out" a given string, *string$*. It does this by inserting spaces between each character of the string.

Our loop variable, *loop%* goes from 1 to the length of *string$* (line 40). We use MID$ with a length of 1 to pick out each character in turn, and print it with an accompanying space (line 50).

Program VII also uses this technique to pick out individual letters, but it's far fancier – it reverses the string you put in.

We do this by using a loop (60-80) to build up a string *reverse$* by adding the single character we've picked out with MID$ to the **front** of the last *reverse$*. *reverse$* is initially the null string (line 40).

```
   10 REM PROGRAM VII
   20 MODE 6
   30 REPEAT
   40 reverse$ = ""
   50 INPUT "String", string$
   60 FOR loop% = 1 TO LEN( string$ )
   70 reverse$ = MID$( string$, loop%,
1 ) + reverse$
   80 NEXT
   90 PRINT TAB(7) reverse$
  100 UNTIL FALSE
```

Program VII

Suppose that, when prompted by line 50, we input ABC. That is, *string$ = "ABC"*.

The first time through the loop line 70 would make *reverse$* equal to A. This is because, since *loop%* is 1, MID$ picks out the A of ABC. It then tags onto the back of it the current content of *reverse$*, which is null, and stores the whole back in *reverse$*.

Next time through *loop%* is 2, so MID$ picks out B. It then adds **after** it the current content of *reverse$*, A, so you end up with BA in *reverse$*.

The last time through *loop%* is 3, so we pick out the C from *string$*. We then tag onto it *reverse$*, which is BA, to obtain CBA, our final *reverse$*, the exact reverse of the string we input.

One of the main uses of MID$ is to pick out data strings from longer data strings. For example, we might modify Program III to take into account middle names. Each record will then consist of three parts, or fields as they are known.

We would still pad out each field so that it was exactly 10 characters long, so that now each record would be 30 characters long.

We could still use *LEFT$(name$(loop%),10)* to pick out the first names, and *RIGHT$(name$(Loop%),10)* to pick out the last name. To print out the middle names we'd use MID$ in a loop of the form:

```
FOR loop% = 1 TO 4
PRINT MID$( name$( loop% ), 11, 10)
NEXT loop%
```

As Figure I shows, we know that for

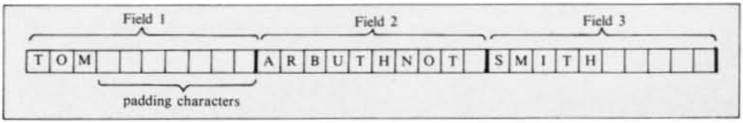

Figure I: Fixed field records

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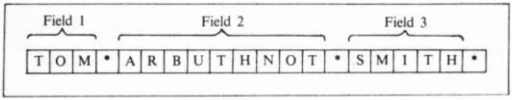

Figure II: Variable field records

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each record, since each field is exactly 10 characters long, the middle name field starts at character 11. We then use MID$ to pick out the 10 characters starting there to give us the middle name.

We can use MID$ in this way because we **know** that the second field starts at character 11 – we've organised our data that way.

Making the fields in every record a standard length can really speed things up – the computer knows exactly where things are to be found in each field.

However those fields are bound to contain a lot of padding blanks which the micro has to remember. So this method of fixed length fields, though quick and easy to program with, is very wasteful of memory.

There is another way of storing records – with variable length fields. You just remember as many characters as you need for each field. You separate each field with a special "marker" character so that the micro knows where one field ends and another begins.

Figure II shows how the record of Figure I would be stored in this method – using an asterisk as the marker. To find, say, the third field of a record, you search for the second and third asterisks – you then want the characters in between.

```
   10 REM PROGRAM VIII
   20 MODE 6
   30 REPEAT
   40 INPUT "String", string$
   50 FOR loop% = 1 TO LEN( string$ )
   60 IF MID$( string$, loop%, 1 ) =
"*" THEN PRINT " Asterisk at character
"; loop%
   70 NEXT
   80 UNTIL FALSE
```

Program VIII

This method tends to be less rigid and more economical of memory than fixed length fields. It is, however, far slower, since you have to search each of the records you're considering for the asterisks bounding the field you require.

Program VIII shows the sort of technique we need to find the records. It hunts out any asterisks in a string.

When you run it enter a string with a few asterisks in it to mimic a record with variable length fields. You'll find it quite simple to follow the action.

```
   10 REM PROGRAM IX
   20 MODE 6
   30 REPEAT
   40 INPUT LINE "String", string$
   50 FOR loop% = 1 TO LEN( string$ )
   60 IF MID$( string$, loop%, 1 ) =
CHR$(32) THEN PROCinsert
   70 NEXT
   80 PRINT TAB(7) string$
   90 UNTIL FALSE
  100 END
  110 REM ============================
  120 DEF PROCinsert
  130 string$ = LEFT$( string$,
loop%-1) + "*" + RIGHT$( string$,
LEN(string$) - loop% )
  140 ENDPROC
```

Program IX

Program IX uses the same sort of technique to search for spaces in a string, replacing each with an asterisk. Notice line 40. We're using INPUT LINE for the first time. This works in much the same way as INPUT but accepts everything you type – spaces, commas and all – until you press Return.

INPUT on its own would only accept the characters up to the comma or space, and reject the rest. If you don't believe me, try entering:

```
123,456
```

or

```
GOOD MORNING EVERYONE
```

into a line something like:

```
INPUT string$
```

To return to Program IX. The loop of lines 50 to 70 then searches the string for spaces using MID$ and goes to PROCinsert if it finds one.

Notice that when the program does find a space the value of *loop%* indicates the position of the space in the string. PROCinsert works by splitting the string in two on either side of the space. It uses:

```
LEFT$( string$, loop% - 1 )
```

to get all the characters on the **left** of the space. Note the *loop% –1:* we want the characters up to but not including *loop%*.

PROCinsert uses:

```
RIGHT$( string$, loop% + 1)
```

to find all the characters to the **right** of the space. Note we start one past *loop%*. Line 130 then neatly joins these two portions, with an asterisk in the middle. Hence the asterisk appears to replace the space.

Of course, we needn't have replaced the space with one asterisk – we could have inserted, say, the word SPACE. Just because you're getting rid of one character you don't have to replace it with just a single character.

In fact you don't have to replace it at all. In that case Program IX's effect would be to squeeze all spaces from a string.

A word of warning. When you're inserting and deleting from strings remember that the length of the string changes. You can give yourself real headaches if you forget this.

You'd use this replacement technique when you needed to update information – say changing a bride's surname or altering Rhodesia to Zimbabwe and so on.

```
   10 REM PROGRAM X
   20 MODE 6
   30 REPEAT
   40 INPUT LINE "String", string$
   50 FOR loop% = 1 TO LEN( string$ )
   60 IF INSTR( "AEIOUaeiou" ,MID$(
string$, loop%, 1 ))  THEN PROCinsert
   70 NEXT
   80 PRINT TAB(7) string$
   90 UNTIL FALSE
  100 END
  110 REM ============================
  120 DEF PROCinsert
  130 string$ = LEFT$( string$,
loop%-1) + "*" + RIGHT$( string$,
LEN(string$) - loop% )
  140 ENDPROC
```

Program X

Program X replaces all the vowels in a string with asterisks. Line 60 does the

→

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work, using INSTR to see if the relevant character of the string (extracted with MID$) is in the string "AEIOUaeiou".

Notice that PROCinsert remains the same.

```
   10 REM PROGRAM XI
   20 MODE 6
   30 REPEAT
   40 alphabet$ =
"ABCDEFGHIJKLMNOPQRSTUVWXYZ"
   50 PRINT '"Enter a letter"
   60 letter$ = GET$
   70 FOR loop% = 1 TO 26
   80 IF letter$ = MID$( alphabet$,
loop%, 1) THEN PRINT 'letter$; " is
letter "; loop% ; " of the
alphabet."'
   90 NEXT loop%
  100 UNTIL 0
```

Program XI

Program XI uses the methods we've been looking at to tell you the position in the alphabet of a capital letter you've input. I leave it to you to work out exactly how!

```
   10 REM PROGRAM XII
   20 MODE 6
   30 REPEAT
   40 alphabet$ =
"ABCDEFGHIJKLMNOPQRSTUVWXYZ"
   50 PRINT '"Enter a letter"
   60 letter$ = GET$
   70 position% = INSTR( alphabet$,
letter$ )
   80 IF position% <> 0 THEN PRINT
'letter$; " is letter "; position% ; "
of the alphabet."'
   90 IF position% = 0 THEN PRINT
'"CAPITAL letters, please."
  100 UNTIL 0
```

Program XII

Program XII does exactly the same, but using INSTR in a way we haven't seen before. You see, INSTR doesn't only tell you whether a character is in a given string or not – it also tells you where in the string it is.

In line 70 *position%* would have the value 5 if you'd typed in E. If the character wasn't in *alphabet$*, *position%* would have been 0.

There's a lot more to INSTR than we've looked at. For a start, you don't have to restrict yourself to looking for single characters. Try:

```
PRINT INSTR( "ABCDE", "DE" )
```

However, that's beyond the scope of this series of articles. You see, rather sadly we've come to the parting of the ways. You've still a lot to learn about programming – as have I – but now you can manage by yourself.

The User Guide and some of the excellent books on the market should make quite a bit of sense to you now, so you should have no trouble learning.

Remember, though, there are really only two surefire ways to learn programming:

- Read other people's programs and try to work out what's going on.
- Do some programming yourself!

Oh yes, and thanks for all the letters – they've made writing this series the pleasure it was.

All the articles from Mike Bibby's Beginners series are being reprinted in book form. Full details in next month's issue.

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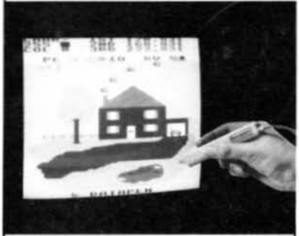

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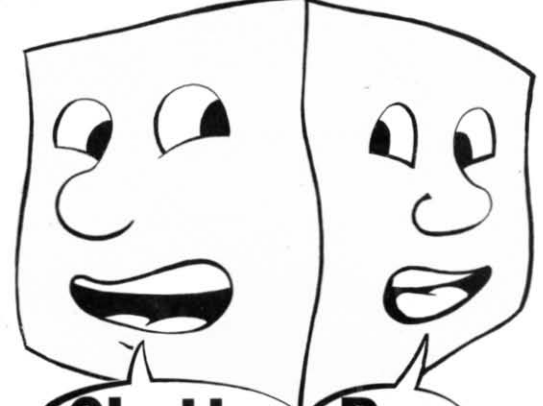

Chatter Box has quite a lot to say for itself

By MIKE COOK

ONE of the more interesting enhancements for your BBC Micro is the Acorn speech synthesiser system. It allows the computer to talk in a clear voice but with a limited vocabulary.

The manual which accompanies the upgrade explains in great detail the syntax of the SOUND command used to produce spoken words or part words, but does not tell you how you can incorporate them into a program.

This program, Chatter Box, shows several techniques that can be used to drive the speech synthesiser, and the procedures used may be culled and incorporated into your own programs.

I will not delve into the syntax of the sound statement here because this program will only be of interest to you if you have a speech chip, in which case you will already have the Speech System User Guide which explains it well.

One of the main requirements of a program using speech is to say phrases. If the Acorn manual were to be believed this would have to be done using a long series of SOUND statements, one for each word.

There is an easier way however – by using strings. The procedure _PHRASE (lines 790 to 860) has a string variable passed to it. Each character of the string corresponds to a word or part word of the phrase to be uttered.

The procedure then scans the phrase, one character at a time, producing each word. The character in a string can only have a value between 0 and 255, but the sound chip requires numbers up to 291. This is remedied in line 830 as, if you define a character in a string to have an Ascii value of greater than 255, you will get a wrap-around effect. That is, 255 is effectively subtracted from the number.

The program can therefore build up phrases in string variables, or string arrays, and simply pass the string to the phrase procedure when required.

There are two ways in which you can build up such string arrays. The first is most useful for short phrases and is shown on line 310 among others.

Each string is built of the individual CHR$ value for the word. A list of numbers to use is given in appendix A of the speech system manual.

The second way is useful when building up long phrases, and is shown in lines 360 to 410. In this method the numbers making up the phrase are stored in a DATA statement, the first number in the statement being the number of elements to be included in the string.

Once the string has been defined it can be used very easily in several different parts of the program. Lines 280 to 640 contain a number memory game like the popular Simon Says.

The computer will ask you to type in a string of numbers. If you get them right it will try you with another set containing one more number. The set of numbers will get longer and longer until you make a mistake. Your score will then be the number you successfully remembered.

The BBC Micro has a long sound buffer and at times you do not want the program to do anything until the phrase has finished. This is achieved by the procedure _FIN (lines 1030 to 1060) by looping until the sound buffer is empty.

The other major requirement of a speech system is to say numbers. This is not so easy as might at first be assumed. The chip will say certain numbers directly, but others must be built up from their component parts.

The program uses the procedure _SAY to say the number passed to it. This is written at the end of the program and lines 1070 to 1390 may be incorporated in your own programs.

This procedure also neatly illustrates the use of recursion in programming. Recursion is where a procedure calls itself, one or many times. Of course there must be some restriction on this to stop it crawling up its own FOR/NEXT loop.

When using recursion it is useful to think that the procedure you are writing already exists and can cope with a simple subset of the problem you are coding.

This part of the program contains another procedure _NUM. This makes the system say any number sent to it in the restricted range of 1 to 99.

It uses the relationship between the numbers used by the speech system and the number you wish to say to achieve this result.

Also several IF statements are used to catch exceptions to this relationship, for example when the number is twelve rather than two teen. This procedure is

→

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called by the first one whenever the number it is dealing with is within these limits.

When saying a large number in the English language – as opposed to American – we include the word "and" before saying the last part of the number. For example, one hundred and eighty. The procedure _SAY inserts it into the correct place.

There is no limit on the size of the number that this procedure can cope with, but, as thousand is the largest number the speech system can say, one million comes out as "one thousand thousand".

The procedure _SAY starts off by checking for a zero value and if it finds one, says zero and ends. Next, if the number is negative it says minus and then strips the number of its negative sign. If the number is an integer then the next section is skipped. (Oh no! A GOTO!)

If it is not an integer, the integer part is separated in line 1120 and sent to this procedure to be spoken. This is the first example of the use of recursion.

As the number passed to the recalled procedure is an integer we will not create an endless loop. When the procedure returns the fractional part of the number is converted into a string and each digit is individually spoken, for example twelve point one two (lines 1140 to 1230) and then the procedure ends.

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This leaves the procedure to cope with only integers from now on. Line 1240 tests to see if we can say the number with our procedure _NUM. If this is so, we call it and then end. Line 1250 tests if we need to say thousand at some time. If we do, our number is divided by a thousand and then sent to this procedure.

Again this is recursion, the number re-entered is smaller and so eventually this stage will be bypassed.

When the procedure returns the word thousand is said and the number we are dealing with is reduced so that it is the fractional part of division by a thousand. The same happens in line 1260, only this copes with saying hundred. Line 1270 puts the and in the correct place.

Finally line 1280 mops up the last bit of the number.

As you can see, with recursion you can get a small amount of code working quite hard for its living, something rarely achieved when writing programs in Basic.

The procedure described is used in reciting any multiplication table. If you have never heard Kenneth Kendall reciting the minus three hundred and twenty one point seven nine two times table you are in for a treat!

Full listing starts on Page 137

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EDFAX HAS SO MANY USES

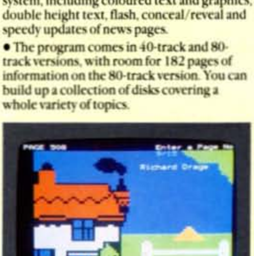
Edfax is ideal for projects like electronic magazines, exhibition notice boards and home data bases. Computer dealers have used them to create software catalogues; schools have created displays of students work for open days; libraries have created information systems; art classes have explored computer graphics; children have illustrated stories and history projects.

The program comes with an 80-page sample database, giving examples of childrens work. You will see that Edfax is entirely content free and can be used right across the curriculum, or at home for recreational purposes

Edfax pages can consist of words, numbers, diagrams, tables, pictures – and a mixture of these.

SUPER FEATURES

- The powerful EDIT program allows you to implement all the features of a teletext system, including coloured text and graphics, double height text, flash, conceal/reveal and speedy updates of news pages.
- The program comes in 40-track and 80-track versions, with room for 182 pages of information on the 80-track version. You can build up a collection of disks covering a whole variety of topics.



- Having created your information pages, the DISPLAY program enables any page, or sequence of pages, to be recalled, simply by entering a three-digit page number. Users simply follow the instructions you provide to find their way through the database.
- The cycle page facility enables you to create automatic displays, with variable time delays between the pages. All the pictures on this page were created by schoolchildren using Edfax.

FIRST RATE PACKAGE

Parents and teachers will be delighted with the Edfax documentation. This consists of an illustrated 80-page book, in two colours, fitting with the disk into a stout PVC wallet. A coloured key-strip and screen planning sheet are also included.

The educational thinking behind the disk represents the fruit of extensive school trials co-ordinated by the Microelectronics Education Program (MEP). Edfax was developed by the MEP and is regarded as one of its most significant contributions to educational software development.

FURTHER SAVINGS TO BE MADE

For example: **Classroom Pack.**
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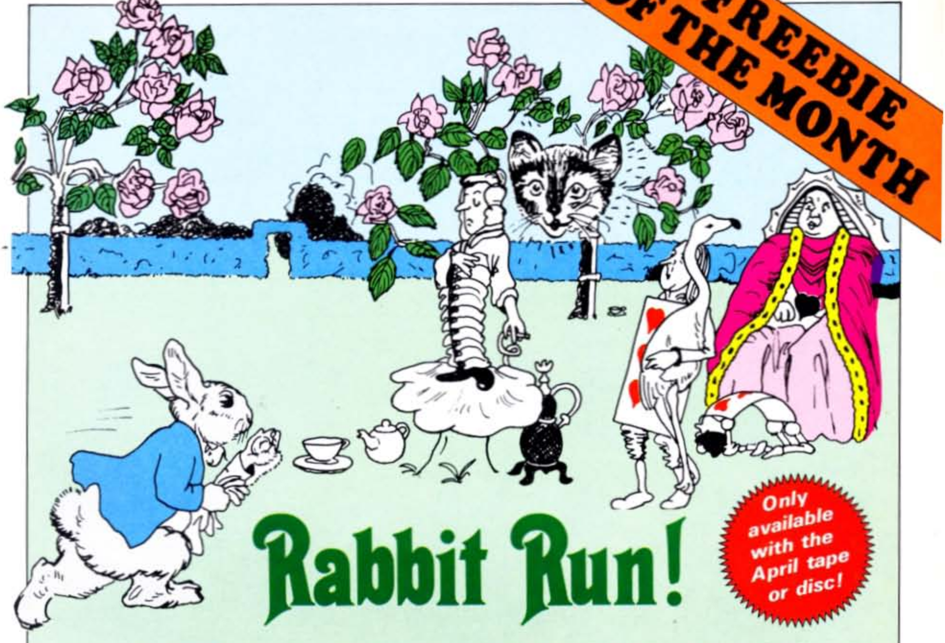
FREEBIE OF THE MONTH



Rabbit Run!

Only available with the April tape or disc!

THIS month's free program for all readers who buy The Micro User's monthly tape or disc is Rabbit Run – a machine code maze game that's even more fun than the Mad Hatter's tea party.

The Queen of Hearts has stolen the tea-service and scattered it throughout her maze of rose bushes. Your job, as the White Rabbit, is to find everything and exit before time runs out.

If that were not enough, you are pursued by the Cheshire Cat, flamingoes and playing cards who combine in an all-out effort to stop you. These characters move "intelligently", hunting you relentlessly – but with practice you can predict their movement and, with luck, out-run them.

It won't be the White Rabbit who's gasping "I'm late, I'm late". It will be you as you become addicted to this fascinating trial of skill and strategy.

DON'T FORGET!

SPECIALLY selected full-length games – too long to be printed in the magazine itself – now come absolutely free with the monthly tapes and discs from The Micro User.

The December extra is the highly acclaimed Omega Probe – a high speed, all action machine code arcade game that has won rave reviews from the computing press.

The January tape/disc has as its bonus Galactic Tycoon – a game of financial endeavour in the further reaches of space that will intrigue players of all ages.

The February freebie was Atomic Protector – a fast and furious machine code game in which you try to avert impending nuclear disaster.

March saw Flex as the Freebie. It's an all-action game of skill involving a wizard's store house of DNA and your attempts to grab it in sufficient quantity to exist.

Omega Probe
GALACTIC TYCOON
Atomic Protector
FLEX

To order your tape or disc complete the coupon on Page 173

Part three

HOW TO WRITE MACHINE CODE GAMES

By KEVIN EDWARDS

Face up to it, you don't need to move one pixel at a time

LAST month we found that moving objects around the Mode 2 screen – left and right – was quite easy. The main problem was how to delete the character. We solved it by using the EOR function, which provided us with a method of displaying and deleting a character by using just one routine.

This month we're going to move shapes up, down, left and right. In the process we'll also find out how difficult it is to move a shape up and down the screen one pixel at a time. So far, to display characters we've used an indexing method when accessing the screen.

The base location is used to indicate the start position of the character – its top left corner. Changing this base location allows us to move the object to other parts of the screen.

As we saw last time, adding 32 to the base location moves an object right by one character cell, and subtracting 32 from the base location moves the shape left one character cell.

This may satisfy certain needs, but for most cases finer movement is needed.

To do this we subtract or add eight to the base location. Subtracting eight moves the character left by two pixels and adding eight moves the character right by two pixels.

Let me stress that adding or subtracting eight moves the base location to an adjacent column. Remember, each character row has 80 columns of eight vertical bytes – each column byte corresponds to two pixels. That's why the object moves two pixels when eight is added or subtracted.

Moving an object left or right by one pixel is very awkward. This is because each memory location represents two pixels.

It means that in addition to changing the base location, the character data must also be changed – shifted in the appropriate direction by one pixel.

The easiest way to shift the data is to store the character data again – displaced by one pixel.

The result is that twice as much memory is needed to store the character data. In Mode 2, memory is very valuable and so it's always best to avoid repeating data.

Software techniques can be used to shift characters across by one pixel, but these are very time consuming and so are rarely used – speed is considered more important than looks.

Nearly all commercial games written in Mode 2 move characters left and right by two pixels, so don't get paranoid because you haven't got true pixel movement. It's just not worth the extra memory and effort required, and in any case, moving two pixels at a time produces very smooth movement.

If you don't believe me try Program I. All you'll see is a face character go across the screen – left to right.

Program II allows you to move the face character left or right. The direction is controlled by pressing the Z and X keys – Z to move left and X to move right.

We can now move a character left or right. The next thing to do is move it up or down. I'm afraid this is the most complex part of character movement.

It's simple to move a character up or down by one character line. To do this, 640 must be subtracted or added to the base location. Adding 640 moves down one character line and subtracting 640 moves up one line. Why 640?

Each character line has 80 columns of eight bytes. So the next line begins at the previous line's base location plus 640 (80 * 8).

The start locations of the first three

→

```
 10 REM PROGRAM II
 20 MODE 2
 30 FOR pass=0 TO 2 STEP 2
 40 P%=&B00
 50 [OPT pass
 60 .left LDA#19:JSR&FFF4
 70 JSR character
 80 LDA display+1
 90 SEC
100 SBC#8
110 STA display+1
120 STA eor_screen+1
130 BCS no_decrement
140 DEC display+2
150 DEC eor_screen+2
160 .no_decrement JSR character
170 RTS
180 .right LDA#19:JSR&FFF4
190 JSR character
200 LDA display+1
210 CLC
220 ADC#8
230 STA display+1
240 STA eor_screen+1
250 BCC no_increment
260 INC display+2
270 INC eor_screen+2
```

Program II

```
   10 REM PROGRAM I
   20 MODE 2
   30 FOR pass=0 TO 2 STEP 2
   40 P%=&B00
   50 [OPT pass
   60 .right LDA#19:JSR&FFF4
   70 JSR character
   80 LDA display+1
   90 CLC
  100 ADC#8
  110 STA display+1
  120 STA eor_screen+1
  130 BCC no increment
  140 INC display+2
  150 INC eor_screen+2
  160 .no_increment JSR character
  170 RTS
  180 .character LDY#31
  190 .getbyte LDA&C00,Y
  200 .eor_screen EOR&5300,Y
  210 .display STA&5300,Y
  220 DEY
  230 BPL getbyte
  240 RTS
  250 ]NEXT
  260 FOR loop=0 TO 31
  270 READ data
  280 loop?&C00=data
  290 NEXT
  300 CALL character
  310 FOR loop=1 TO 75
  320 CALL right
  330 NEXT
  340 END
  350 REM Face data
  360 DATA5,15,10,15,15,15,15,5
  370 DATA15,15,5,15,15,5,0,15
  380 DATA15,15,10,15,15,10,0,15
  390 DATA10,15,5,15,15,15,15,10
```

Line No.	
10-50	Enter assembler.
60	Main entry point. This line executes a *FX 19 command (wait for vertical sync.). Used as a time delay to produce smooth movement without flicker.
70	Delete the face character. Remember, calling an EOR character routine the second time deletes the character.
80-150	Add eight to the base address – move the character right by two pixels.
160	Display the face in its new screen position.
170	End of the main routine.
180-240	Subroutine to display the face on the screen.
250	Exit assembler.
260-290	Read and store the face data in page &C.
300	Put face on the screen – initial set-up.
310-330	Move the face right through 75 positions.
340	End of program.
350-390	Face data.

Description of Program I

```
  280 .no_increment JSR character
  290 RTS
  300 .character LDY#31
  310 .getbyte LDA&C00,Y
  320 .eor_screen EOR&5300,Y
  330 .display STA&5300,Y
  340 DEY
  350 BPL getbyte
  360 RTS
  370 ]NEXT
  380 FOR loop=0 TO 31
  390 READ data
  400 loop?&C00=data
  410 NEXT
  420 X=0
  430 CALL character
  440 REPEAT
  450 IF INKEY(-98) AND X>0 CALL left
:X=X-1
  460 IF INKEY(-67) AND X<76 CALL rig
ht:X=X+1
  470 UNTIL 1=2
  480 REM Face data
  490 DATA5,15,10,15,15,15,15,5
  500 DATA15,15,5,15,15,5,0,15
  510 DATA15,15,10,15,15,10,0,15
  520 DATA10,15,5,15,15,15,15,10
```

Line No.	
10-50	Enter assembler.
60	Wait for vertical sync.
70	Delete the face.
80-150	Subtract eight from the base location – move the character left by two pixels.
160	Display the character in it's new position.
170	End of routine.
180	Wait for vertical sync.
190	Delete the face.
200-270	Add eight to the base location – move it right by two pixels.
280	Display the face.
290	End of routine.
300-360	Subroutine to display the face on the screen.
370	Exit assembler.
380-410	Read and store graphic data.
420	X coordinate=0.
430	Display the character.
440	Start of an infinite loop.
450	Check if Z is pressed. Move the character left as long as the X coordinate remains on the same character row. And then decrease the X coordinate.
460	Check if X is pressed. Move the character right as long as the X coordinate remains on the same character row. And then increase the X coordinate.
470	Loop round.
480-520	Face data.

Description of Program II

```
  10 REM PROGRAM III
  20 MODE 2
  30 FOR pass=0 TO 2 STEP 2
  40 P%=&B00
  50 [OPT pass
  60 .up LDA#19:JSR&FFF4
  70 JSR character
  80 LDA display+1
  90 SEC
 100 SBC#&80
 110 STA display+1
 120 STA eor_screen+1
 130 LDA display+2
 140 SBC#2
 150 STA display+2
 160 STA eor_screen+2
 170 JSR character
 180 RTS
 190 .down LDA#19:JSR&FFF4
 200 JSR character
 210 LDA display+1
 220 CLC
 230 ADC#&80
 240 STA display+1
 250 STA eor_screen+1
 260 LDA display+2
 270 ADC#2
 280 STA display+2
 290 STA eor_screen+2
 300 JSR character
 310 RTS
 320 .character LDY#31
 330 .getbyte LDA&C00,Y
 340 .eor_screen EOR&3000,Y
 350 .display STA&3000,Y
 360 DEY
 370 BPL getbyte
 380 RTS
 390 ]NEXT
 400 FOR loop=0 TO 31
 410 READ data
 420 loop?&C00=data
 430 NEXT
 440 Y=0
 450 CALL character
 460 REPEAT
 470 IF INKEY(-73) AND Y>0 CALL up:Y
=Y-1
 480 IF INKEY(-105) AND Y<31 CALL do
wn:Y=Y+1
 490 UNTIL 1=2
 500 REM Face data
 510 DATA5,15,10,15,15,15,15,5
 520 DATA15,15,5,15,15,5,0,15
 530 DATA15,15,10,15,15,10,0,15
 540 DATA10,15,5,15,15,15,15,10
```

Program III

Line No.	
10-50	Enter assembler.
60	Wait for vertical sync.
70	Delete character.
80-160	Subtract &280 from the base location – move the character up one line.
170	Display the character.
180	Exit.
190	Wait for vertical sync.
200	Delete the character.
210-290	Add &280 to the base location – move the character down one line.
300	Display the character.
310	Exit.
320-380	Subroutine to display the character on the screen.
390	Exit assembler.
400-430	Read and store the face data.
440	Y coordinate=0.
450	Display the face.
460	Start of loop.
470	Check the : key. Move the character up if the key is pressed and the character remains on the screen. And then increment the Y coordinate.
480	Check the / key. Move the character down if the key is pressed and the character remains on the screen. And then decrement the Y coordinate.

Description of Program III

From Page 104

character rows are &3000, &3280 and &3500 respectively. Each increases by &280 as you go down the screen. The clever among you will know that &280=640.

Also notice that the difference in memory locations between the same position on ANY adjacent character lines is always &280.

Program III allows you to move a character up and down the screen, one line at a time. Use / to move the character down and : to move it up.

Subtracting or adding 640 from the base location produces character movement up or down. What do we do if we want to move the character up or down by one pixel? There is no simple solution.

To simplify things we'll forget moving a whole character and move a single byte instead. First we'll move a byte down the screen.

You'll find it a lot easier to understand the following information if you read it in conjunction with Diagram I.

Initially, the screen location we store the byte in is &3000 – the top left of the screen. To move the byte down by one pixel we increment the screen location by one – to &3001. All goes fine, incrementing the location until we reach location &3007 – the bottom of the character row.

At this point incrementing the screen location to &3008 moves it to the top of the next column on the same line. In fact, the location we want to store the

	COLUMN					
	0	1	2	...	78	79
HIMEM	&3000	&3008	&3010	...	&3270	&3278
	&3001	&3009	&3011	...	&3271	&3279
	&3002	&300A	&3012	...	&3272	&327A
ROW 0	&3003	&300B	&3013	...	&3273	&327B
	&3004	&300C	&3014	...	&3274	&327C
	&3005	&300D	&3015	...	&3275	&327D
	&3006	&300E	&3016	...	&3276	&327E
	&3007	&300F	&3017	...	&3277	&327F
	&3280	&3288	&3290	...	&34F0	&34F8
	&3281	&3289	&3291	...	&34F1	&34F9
	&3282	&328A	&3292	...	&34F2	&34FA
ROW 1	&3283	&328B	&3293	...	&34F3	&34FB
	&3284	&328C	&3294	...	&34F4	&34FC
	&3285	&328D	&3295	...	&34F5	&34FD
	&3286	&328E	&3296	...	&34F6	&34FE
	&3287	&328F	&3297	...	&34F7	&34FF
	&3500	&3508	&3510	...	&3770	&3778
	&3501	&3509	&3511	...	&3771	&3779
	&3502	&350A	&3512	...	&3772	&377A
ROW 2	&3503	&350B	&3513	...	&3773	&377B
	&3504	&350C	&3514	...	&3774	&377C
	&3505	&350D	&3515	...	&3775	&377D
	&3506	&350E	&3516	...	&3776	&377E
	&3507	&350F	&3517	...	&3777	&377F

Diagram I

```
10 REM PROGRAM IV
20 REM By Kevin Edwards
30 MODE 2
40 FOR pass=0 TO 2 STEP 2
50 P%=&B00
60 [OPT pass
70 .start LDA#63
80 .display STA&3000
90 LDA display+1
100 AND#7
110 CMP#7
120 BEQ bottom_of_column
130 INC display+1
140 RTS
150 .bottom_of_column LDA display+1
160 CLC
170 ADC#&79
180 STA display+1
190 LDA display+2
200 ADC#2
210 STA display+2
220 RTS
230 ]NEXT
240 FOR loop=1 TO 100
250 CALL start
260 REPEAT UNTIL GET
270 NEXT
```

Line No.	
10-60	Enter assembler.
70	Load the accumulator with the byte to be stored in the video RAM.
80	Store the accumulator in the video RAM – display the byte (two white pixels).
90-110	Check if the location of the byte displayed is at the bottom of a character row.
120	Branch if it is at the bottom of a character row.
130	Increment the screen location – move the byte down one pixel.
140	Exit.
150-210	Add &279 to the screen location – this moves the byte to the top of the next character row.
220	Exit.
230	Exit assembler.
240	Start of loop.
250	CALL the routine.
260	Wait until a key is pressed.
270	End of loop.

Description of Program IV

byte in – to move it down one pixel – is &3280 and not &3008.

We now have a problem. How can we tell if we increment the screen location by one or add a much larger number to it?

The clue is that we increment the byte by one only if the current screen location is not at the bottom of the character row and we add &279 if it is at the bottom of the character row – this moves the byte to the top of the next character row.

But how do we know if a screen location is at the bottom of the character row? The answer can be found by using the logical operator AND.

Figure I is a list of some of the locations at the bottom of character row 0. Each location is followed by its binary equivalent.

Have you noticed a pattern? If not, take a look at the binary patterns for the low bytes of the screen locations.

The answer is that the three least significant bits of the low byte of the screen address are all set to 1.

So if bit 0=1 AND bit 1=1 AND bit 2=1 the screen location is at the bottom of the character row.

In practice, we AND the screen location with 7 – we get seven from 4+2+1, bit 2,1 and 0 being set. If the resultant byte is seven then the first three bits of the low byte must be set. In which case the location is at the bottom of a character row. In assembly, the required check would look something like this:

```
   Screen        high         low
   location      byte         byte

   &3007 = % 00110000   00000111
   &300F = % 00110000   00001111
   &3017 = % 00110000   00010111
   &301F = % 00110000   00011111
   &3027 = % 00110000   00100111
     .           .            .
     .           .            .
   &3277 = % 00110010   01110111
   &327F = % 00110010   01111111
```

Figure I

```
.down_pixel     LDA screenlow
                AND #7
                CMP #7
                BNE not_at_bottom
                LDA screenlow
                CLC
                ADC #&79
                STA screenlow
                LDA screenhigh
                ADC #2
                STA screenhigh
                JMP rest_of_program
.not_at_bottom  INC screenlow
.rest_of_program
```

Program IV moves a byte down the screen one pixel at a time. Press a key to continue the movement. Moving shapes up the screen by a pixel is very similar to moving it down.

A byte can be moved up by decrementing the screen address. When the byte reaches the top of a character row a much larger number must be subtracted from the screen location – this larger number is &279.

Now we have to find a way of testing whether a screen location is at the top of a character row. Again, we do this by using the AND function. Consider the following locations which are all at the top of character row 1:

```
   Screen        high         low
   location      byte         byte

   &3280 = % 00110010   10000000
   &3288 = % 00110010   10001000
   &3290 = % 00110010   10010000
   &3298 = % 00110010   10011000
   &32A0 = % 00110010   10100000
     .           .            .
     .           .            .
   &34F0 = % 00110100   11110000
   &34F8 = % 00110100   11111000
             ------------------
             ???????? ?????000
             ------------------
```

Again bits 0,1 and 2 of the screen address low byte give us the answer – they are all zero this time.

So if bit 0=0 AND bit 1=0 AND bit 2=0 the screen location is at the top of a character row.

In machine code we AND the low byte with 7, and if the result is 0 then the screen location is at the top of the character row, otherwise the location is

→

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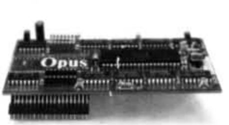

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From Page 107

at another position in the character row.

Here is a check routine for moving a screen location up by one pixel.

```
.up_pixel       LDA screenlow
                AND #7
                BNE not_at_top
                LDA screenlow
                SEC
                SBC #&79
                STA screenlow
                LDA screenhigh
                SBC #2
                STA screenhigh
                JMP rest_of_program
.not_at_top     DEC screenlow
.rest_of_program
```

Program V moves a byte up the screen one pixel at a time – the reverse of Program IV. Press a key to continue the movement.

It's rather complex isn't it? Wait until you've got to do this for a complete character!

That's enough for this month. Try and absorb as much of it as you can before the next instalment.

```
 10 REM PROGRAM V
 20 REM By Kevin Edwards
 30 MODE 2
 40 FOR pass=0 TO 2 STEP 2
 50 P%=&B00
 60 [OPT pass
 70 .start LDA#63
 80 .display STA&7D87
 90 LDA display+1
100 AND#7
110 BEQ top_of_column
120 DEC display+1
130 RTS
140 .top_of_column LDA display+1
150 SEC
160 SBC#&79
170 STA displav+1
180 LDA display+2
190 SBC#2
200 STA display+2
210 RTS
220 ]NEXT
230 FOR loop=1 TO 100
240 CALL start
250 REPEAT UNTIL GET
260 NEXT
```

Line No.	
10-60	Enter assembler.
70	Load accumulator with byte to be stored in video RAM.
80	Store accumulator in video RAM – display byte.
90-100	Check if location of byte displayed is at top of a character row.
110	Branch if it is at top of a character row.
120	Decrement the screen location – move byte up one pixel.
130	Exit.
140-200	Subtract &279 from screen location – this moves the byte to bottom of previous character row.
210	Exit.
220	Exit assembler.
230	Start of loop.
240	CALL the routine.
250	Wait until a key is pressed.
260	End of loop.

Description of Program V

sub strike

Your submarine is being attacked by wave after wave of enemy helicopters armed with bombs, depth charges and ASGROC (Anti-Submarine Guided ROCkets), the only way to survive is to blast them out of the sky before they can get you - but look out for crashing helicopters, drifting mines and Sonar Subs - and even the fish are dangerous ...

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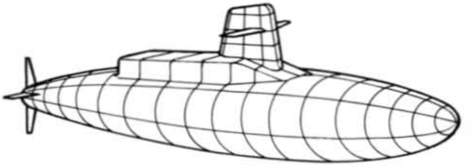

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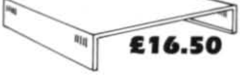

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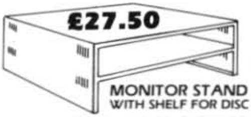

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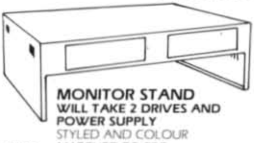

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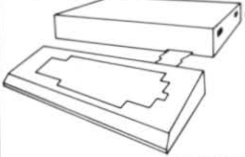

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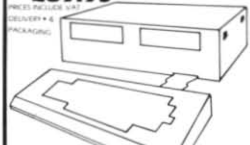

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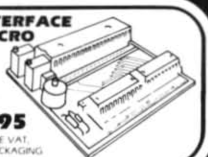

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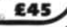

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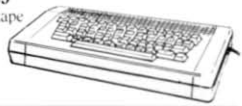

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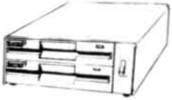

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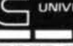

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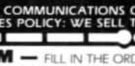

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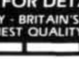

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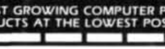

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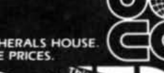

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From Page 65

that you do not need to type in the assembler comments. These are only present so that you can follow the operation of the program and serve no other purpose – so anything on a line that comes after the '\' symbol can be omitted.

Once the listing is entered into the machine you should save the program. When run it will assemble the machine code into locations &900 to &AFF, and once complete it will automatically save the machine code onto disc or tape under the file name DITHER.

This file can be loaded back in your machine whenever you want to use the program. Depending on the type of filing system that you own, this will have to be done in different ways.

If you are lucky enough to own a disc drive then all you need to do is whenever you want to use this routine in any of your programs put at the first line of your program *DITHER. This will load and initialise the program.

If you are restricted to cassette this code will have to be loaded first and then called from Basic by CALL &0900 to intialise it.

So let's try something. Switch the computer into Mode 2 and type:

```
CALL&0900
COLOUR136:CLS
```

then:

```
*DITHER 3,6,8
```

The screen should start flashing once you have entered the second line, and, on typing in the third line, the screen should quickly fill with a light green colour. If it doesn't check your program carefully.

Once you know it is functioning properly try typing in Program II. This will show you all the colours that can be achieved using our dithering techniques.

You may notice if you look at the above demonstration program that you do not CALL the machine code, but you use it as if it were part of the computer's own language – you call it by typing *DITHER.

This is very unusual, and is achieved by patching it into the machine's own command line interpreter.

All star commands are sent to the micro's command line interpreter. What I have done is to intercept this routine by changing one of the system vectors and redirecting it to my own command line interpreter.

This then tests for the word DITHER. If it is not found control passes back to the original routine. If it matches however, the routine passes control to the dither program, which proceeds to pick up the three numbers it requires.

This small section of machine code, from line 90 to line 290 of Program III, could be tailored to work with any machine code routine that you may want to patch into the operating system . . . but that's another story.

Data for this program can be passed to it in one of three ways:

- You can type the numbers into the computer as data in a statement like this:

```
*DITHER(4,5,10)
```

- The colour numbers can be passed in any of the computer's integer variables, from A% to Z%:

```
*DITHER(A%,B%,C%)
```

- A mixture of both of the above methods can be used:

```
*DITHER(A%,B%,15)
```

The three numbers shown in the statement must be in specific ranges. The first two represent the colour numbers that you want to combine to produce your shade. They are in the range 0-7.

The last number represents the flashing colour number with which you want to dither, which should be in the range 8-15.

If any of the three numbers fall outside any of these ranges the error message shown below will be produced:

```
*DITHER((0-7),(0-7),(8-15))
```

If you experiment with this program you will find it is possible to get some fantastically colourful pictures. Just try it and find out.

If you want to pursue the subject further it is possible to get far more colours than those you can see with Program II simply by altering the dithering pattern used to change the colours.

Dither listing

```
    1 REM*****************************
    2 REM*       Program III         *
    3 REM* (c) The Micro User 1985   *
    4 REM* Written bv P. E. Walker   *
    5 REM*****************************
   10 $&AF0="*DITHER"
   20 FORI=0 TO 2 STEP2
   30 P%=&900
   40 [
   50 OPT I
   60 \  &80,81 - ADDRESS WHERE THE O
LD CLI ADDRESS IS STORED.
   70 \  &82,83 - ADDRESS OF THE TEXT
 STRING IN MEMORY TO BE CHECKED.
   80 \  &84    - VARIABLE POINTER ,
0 IF NUMERIC  -  1 IF VARIABLE.
   90 SEI                 \Disable inter
upts.
   95 LDA&209:CMP#9:BEQ quit \Test if
 *DITHER is already in operation.
  100 LDA&208:STA&80  \Save the addre
ss of the old CLI for future use.
  110 LDA&209:STA&81
  120 LDA#&1E:STA&208 \Change command
 line interpreter vector to new routi
ne.
  130 LDA#9:STA&209
  140 .quit CLI
  150 RTS
  160 .command_line_interpreter
  170 PHA:TXA:PHA:TYA:PHA  \Save all
registers for later use.
  180 STX&82:STY&83          \Get addre
ss of text line, address in X-Y regis
ters.
  190 LDY#0
  200 .LOOP LDA(&82),Y      \Load cont
ents of address pointed to by &82 plu
s Y.
  210  CMP&AF0,Y            \Test for
character in string '*DITHER' at &AF0
.
  220 BNE exit1             \If not a
match , exit new command line interpr
eter.
  230 INY
  240 CPY#7                 \If we've
reached the 7 characters, text matche
```

```
s.
  250 BEQ start_routine    \Branch to
 start_routine if strings match.
  260 JMP LOOP
  270 .exit1
  280  PLA:TAY:PLA:TAX:PLA \Restore a
ll registers with their original valu
es.
  290 JMP(&0080)           \Jump to B
eeb's command line interpreter.
  300 .start_routine
  310 LDA#0:STA&72
  320 JSR chopspace        \Remove al
l unwanted characters upto required c
hr.
  330 LDX&84:CPX#0:BEQ c1  \If &84 eq
uals 0 then we have a numeric literal
.
  340 JSR getvar           \This take
s the variable name A-Z and gets it's
 value
  350 JMP c2
  360 .c1 CLC:SBC#47       \Subtracti
ng 47 from numeric char codes gives t
he No.
  370 .c2 CMP#8:BCS error  \Give erro
r message if parameter >= eight.
  380 STA&70               \Store thi
s as the first colour code at &70.
  390 JSR chopspace        \Remove al
l unwanted characters upto required c
hr.
  400 LDX&84:CPX#0:BEQ c3  \If &84 eq
uals 0 then we have a numeric literal
.
  410 JSR getvar           \This take
s the variable name A-Z and gets it's
 value
  420 JMP c4
  430 .c3 CLC:SBC#47       \Subtracti
ng 47 from numeric char codes gives t
he No.
  440 .c4 CMP#8:BCS error  \Give erro
r message if parameter >= eight.
  450 STA&71               \Store as
the second colour code at &71.
  460 JSR chopspace        \Remove al
l unwanted characters upto required c
hr.
  470 LDX&84:CPX#0:BEQ c5  \If &84 eq
uals 0 then we have a numeric literal
.
  480 JSR getvar           \This take
s the variable name A-Z and gets it's
 value
  490 JMP c6
  500 .c5 CMP#56:BCS one   \If first
char >= 8 then numeric is only single
 char.
  510 LDA#10:STA&72
  520 INY:LDA(&82),Y       \Get next
char of the two character number.
  530 .one CLC:SBC#47      \Subtracti
ng 47 from numeric char codes gives t
he No.
  540 CLC:ADC&72           \Add ten t
o number as it was over ten.
  550 .c6 STA&72           \Store as
dither colour at location &72
  560 CMP#8:BCC error      \Range che
ck the number , must be between 8-15.
  570 CMP#16:BCS error
  580  JMP dither          \If all pa
rameters are OK , then call dither ro
utine.
  590 .chopspace
  600 INY:LDA(&82),Y       \Input nex
t character from text string.
  610 CMP#91:BCS chop1     \Check if
character is outside the alphabetic r
ange.
  620 CMP#65:BCC chop1
  630 LDX#1:STX&84         \Chr alpha
betic so set variable flag to TRUE.
  640 JMP chopend
  650 .chop1               \Range che
ck numeric if outside read next chara
cter.
  660 CMP#48:BCC chopspace
  670 CMP#58:BCS chopspace
  680 LDX#0:STX&84         \Set varia
ble flag to FALSE.
  690 .chopend RTS
  700 .getvar
  710 SEC:SBC#64:CLC       \Subtracti
ng 64 from alpha codes gives chr posi
tion.
  720 ROL A:ROL A:TAX      \Multipy b
y four to give offset in variable tab
le.
  730 LDA&400,X            \Get low b
yte of the variable as the value.
  740 RTS
  750 .error
  760 BRK                  \Produce e
rror message if variable out of range
.
  770 BRK
  780 ]
  790 $P%="*DITHER(<0-7>,<0-7>,<8-15>
)"
  800 P%=P%+LEN($P%)
  810 [
  820 OPT I _
  830 BRK
  840 .dither
  850 \ &70    - FIRST COLOUR IN THE
REQUIRED COLOUR COMBINATION.
  860 \ &71    - SECOND COLOUR IN TH
E REQUIRED COLOUR COMBINATION.
  870 \ &72    - THE FLASHED COLOUR
THAT IS TO BE DITHERED WITH THE ABOVE
.
  880 \ &73,74 - USED FOR TEMPORARY
STORAGE IN COLOUR CALCULATIONS.
  890 \ &75,76 - SCREEN LOCATION THA
T IS CURRENTLY BEING WORKED ON.
  900 \ &77    - PIXEL LINE COUNTER.
  910 \ &78    - COUNT FOR THE NUMBE
R OF CHARACTER LINESTEP
  920 \ &79    - USED TO STORE THE S
CREEN BYTE BEING WORKED UPON.
  930 \ X REG  - HORIZONTAL CHARACTE
R COUNT.
  940 LDA#&2F:STA&76                \
Initialise variables
  950 LDA#0:STA&77:STA&78
  960 LDA#&F8:STA&75
  970 LDX&70:LDA &AE0,X:STA&70      \
Lookup colour masks from table at &AE
0.
  980 LDX&71:LDA &AE0,X:STA&71
  990 LDX&72:LDA &AE0,X:STA&72
 1000 LDX#0
 1010 LDA&70:AND#&AA:STA&74         \
Arrange colour mixture into left and.
right
 1015 LDA&71:AND#&55:ADC&74:PHA     \
pixels. Combine colour1 then colour2.
 1020 LDA&70:AND#&55:STA&74         \
Combine pixels in opposite order.
 1022 LDA&71:AND#&AA:ADC&74:STA&71  \
Colour2 then Colour1.
 1024 PLA:STA&70
 1030  .START
 1040 INX:CLC:LDA&75:ADC#8:STA&75   \
Add eight to the screen address
 1045 LDA&76:ADC#0:STA&76
 1050 LDY#0:LDA(&75),Y:STA&79       \
Load screen byte and save in &79.
 1055 AND#192:BEQ skip              \
Check if both pixels are flashing.
 1060 LDA&79:CMP&72:BNE pixel       \
As flashing, check for correct colour
 mask.
 1070 LDA&70:STA(&75),Y             \
Store colour combination into screen
```

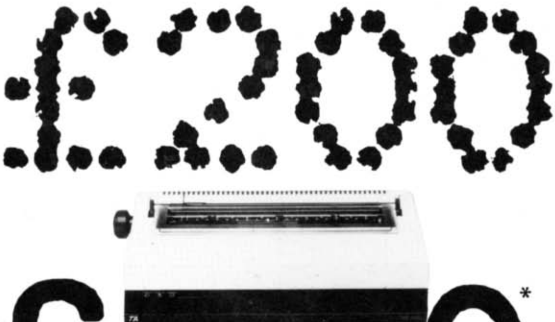
→

Dither listing

From Page 115

```
byte.
 1080 JMP skip
 1085 .pixel \If both pixels are not
flashing this routine fills the corre
ct one
 1090 LDA&79:AND#&AA:STA&73          \
Mask out the right pixel.
 1100 LDA&72:AND#&AA:CMP&73:BNE two \
Test if left pixel is to be dithered
 1110 LDA&70:AND#&AA:STA&73          \
Store left pixel until later.
 1120 .two LDA&79:AND#&55:STA&74     \
Mask out the left pixel.
 1130 LDA&72:AND#&55:CMP&74:BNE done
\Test if right pixel is to be dithere
d.
 1140 LDA&70:AND#&55:STA&74          \
Store right pixel until later.
 1150 .done CLC:LDA&73:ADC&74        \
Combine left and right pixel.
 1155 STA(&75),Y                     \
Store onto the screen.
 1160 .skip
 1170 CPX#80:BNE START               \
Test if we have done 80 bytes.
 1180 .restart LDX#0
 1190 LDY&70:LDA&71:STY&71:STA&70    \
Swap colour patterns for next line.
 1200 INC&77                         \
Increament pixel line count by one.
 1201 LDA&77:CMP#8:BNE sub1          \
Test if 8 pixel lines have been done.
 1210 INC&78:SEC                     \
Increament horizontal line count.
 1211 LDA&75:SBC#7:STA&75            \
Subtract seven from the screen addres
s.
 1215 LDA&76:SBC#0:STA&76
 1216 LDA#0:STA&77:JMP again         \
Reset the pixel line count to zero.
 1220 .sub1 SEC
 1225 LDA&75:SBC#&7F:STA&75          \
Subtract &27F from screen address thi
s will
 1230 LDA&76:SBC#2:STA&76            \
take you onto the next pixel line.
 1240 .again LDA&78:CMP#32:BEQ exit \
Test to see if all the screen is comp
leted.
 1250 .cont JMP START
 1260 .exit PLA:TAY:PLA:TAX:PLA      \
Restore all registers.
 1265 RTS
 1270 ]
 1280 NEXTI
 1290 FORI=0 TO 15:READ A:I?&AE0=A:NE
XTI
 1300 *SAVE DITHER 900 AFF
 1310 END
 1320 DATA 0,3,12,15,48,51,60,63,192,
195,204,207,240,243,252,255
```

This listing is included in this month's cassette tape offer. See order form on Page 173.



You'd expect to pay around £200 for a dot matrix printer – fine for printing documents meant for internal consumption, but not so hot when writing to customers, suppliers, prospects – anyone you want to impress.

Yet for an extra £200 or so, your printout can look – quite simply – superb. The picture shows unretouched examples of a dot matrix printout and a printout from Triumph Adler's new daisywheel printer, the TRD 7020. (Both magnified 16 times.)

The difference speaks for itself: ten times the quality, at only twice the price.

The 7020 is no snail, either. At 20 characters per second (that's just 40 seconds to print this lot), its speed/quality/price ratio is second to none. It's simple to use, too. Just what you'd expect from a company that makes and sells more typewriters than almost anyone else in the world.

So the choice is yours. Cheap and nasty? Or a little bit more for the real thing?

Get in touch with Triumph Adler now for details on the TRD 7020 and the name and address of your local dealer.

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LONDON N1 6EG Tel: (01) 253 5608

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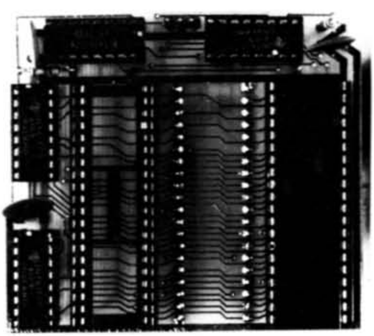

UNBELIEVABLE ?

SEE PAGE 120

UDM

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An exceptionally versatile unit, programs EEPROMS and EPROMs from 2K to 32K.

Powerful, easy to use software in a sideways ROM. Features full screen data editor, files, and softkeys.

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- *C4 0.1uF polycarbonate*
- *C5 10uF Electrolytic*
- *C6 50uF Electrolytic*
- *C7 220pF Polystyrene*
- *C8 C9 0.1uF disc ceramic*
- *VR1 1K Multi-turn pot*
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Name ____________________

Address ____________________

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The order forms for Packs 19 and 20 may be found on page 173. Prices for other packs may be obtained from earlier issues of The Micro User or from Musbury Consultants. (Please send SAE).

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BEL CHARTS, BEL PLOT and (when supplied together) BEL GRAPH

POWERFUL AND SOPHISTICATED YET MENU DRIVEN AND EASY TO USE!
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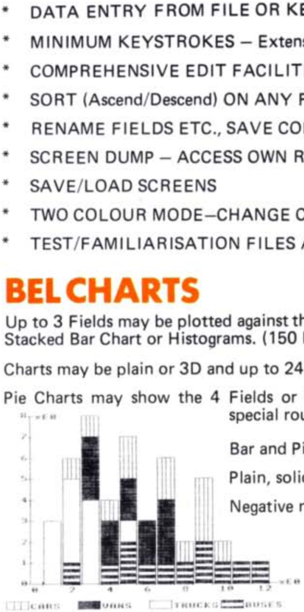
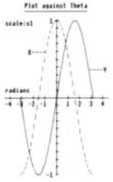


BEL PLOT

Choose Fields/Variables for Vertical and Horizontal Axes. Graphs may be overlayed and there is a Curve Fitting routine which gives the derived equation (up to 7 degree polynomial), plots it and shows the data points. Equations in Y and X and also Parametrics may be entered and plotted.



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BEL CHEM Chemistry 1	9.50		11.50		
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BEL GEN Genealogy	15.00		23.00		
BEL GRAPH	25.00		27.00		
BEL PLOT	16.00		17.00		
BEL SUBS	14.00		15.00		
MAILSHOT	9.50		11.50		
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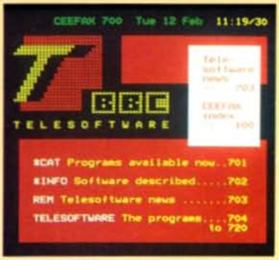
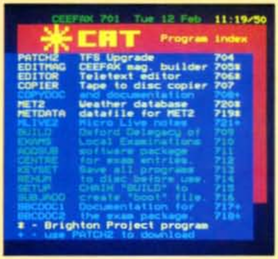


```
CEEFAX 700  Tue 12 Feb  11:19/30

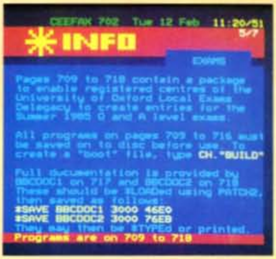
                              Tele-
                              software
                              news
                                   703

                              CEEFAX
                              index
                                   100
T E L E S O F T W A R E

#CAT Programs available now..701
#INFO Software described.....702
REM Telesoftware news .......703
TELESOFTWARE The programs....704
                          to 720
```



```
CEEFAX 701  Tue 12 Feb  11:19/50
  CAT   Program index
PATCH2   TFS Upgrade           704
EDITMAG  CEEFAX mag. builder   705#
EDITOR   Teletext editor       706#
COPIER   Tape to disc copier   707
COPYDOC  and documentation     708+
MET2     Weather database      720#
METDATA  datafile for MET2     719#
MLIVE2   Micro Live notes      721+
BUILD    Oxford Delegacy of    709
EXAMS    Local Examinations    710
ADDSUB   software package      711
CENTRE   for exam entries.     712
KEYSET   Save all programs     713
RENUM    to disc before use.   714
SETUP    CHAIN "BUILD" to      715
SUBJADD  create "boot" file.   716
BBCDOC1  Documentation for     717+
BBCDOC2  the exam package.     718+
# - Brighton Project program
+ - use PATCH2 to download
```



```
CEEFAX 702  Tue 12 Feb  11:20/51
  INFO                           5/7
                       EXAMS
Pages 709 to 718 contain a package
to enable registered centres of the
University of Oxford Local Exams
Delegacy to create entries for the
Summer 1985 O and A level exams.

All programs on pages 709 to 716 must
be saved on to disc before use. To
create a "boot" file, type CH."BUILD"

Full documentation is provided by
BBCDOC1 on 717 and BBCDOC2 on 718
These should be #LOADed using PATCH2,
then saved as follows:
#SAVE BBCDOC1 3000 46E0
#SAVE BBCDOC2 3000 76EB
They may then be #TYPEd or printed.
Programs are on 709 to 718
```

Switch on to teletext -with your BBC Micro!

ENTER the colourful, fascinating world of teletext with the latest Micro User special offer.

The TTX 2000B Teletext adapter for the BBC Micro not only gives access to BBC-TV's Ceefax and ITV's Oracle but also allows you to download software from the BBC's Telesoftware service.

And once you've bought it, there's nothing else to pay! All the information and software comes to you free over the airwaves.

Twice as sensitive as other teletext adapters, the TTX will work where poor reception causes others to fail. And its ability to use all the 16 teletext data lines will allow it to keep pace with planned enhancements in the teletext service.

Simple to fit and easy to operate, it is produced by OEL, one of the leading firms in telecommunications for micros. And it comes with a full 12 month warranty.

The advanced features packed into its exclusive 64 pin chip include:

- **Gives direct access to Oracle, Ceefax and 4-Tel.**
- **Offers free software from the BBC Telesoftware service.**
- **Provides you with easy to use commands.**
- **Ensures sensitive signal reception.**
- **Provides software on ROM – no patches needed.**
- **Access to teletext pages from your own Basic programs.**
- **Has its own power supply.**
- **Works with Econet and second processors.**
- **Allows for future teletext enhancements.**
- **Includes comprehensive, user-friendly manual.**

Teletext can be looked on as an electronic newspaper which is being constantly updated. There are four teletext channels – Ceefax on BBC1 and BBC2, Oracle on ITV and 4-Tel on Channel 4. And they are broadcast at the same time as the TV programmes – even when there is only a test card on the screen!

You can key into news from Britain and around the world, get help with personal and business finance, keep right up to date with the latest sports results, see what's on radio and TV (and even read summaries of serial episodes you may have missed), see detailed weather maps for your region, check on seat availability on flights from UK airports, find out about road traffic conditions, train timetable changes, tourist exchange rates, have fun with brain-teasers, quizzes, word games and crosswords, check up on your horoscope, get expert advice on best buys, access backup material for schools broadcasts – there's no limit to the many thousands of facts that are available when you link the teletext adapter to your BBC Micro!

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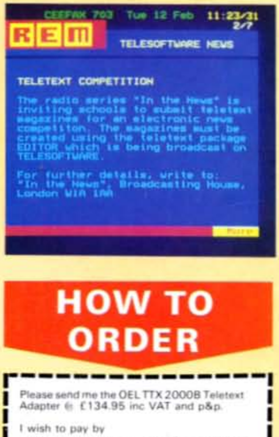
off the normal price of £149.95

This is a MICRO USER special offer!

Only £134.95

includes VAT and p&p



```
CEEFAX 703  Tue 12 Feb  11:23/31
                                 2/7
REM          TELESOFTWARE NEWS

TELETEXT COMPETITION

The radio series "In the News" is
inviting schools to submit teletext
magazines for an electronic news
competiton. The magazines must be
created using the teletext package
EDITOR which is being broadcast on
TELESOFTWARE.

For further details, write to:
"In the News", Broadcasting House,
London W1A 1AA
```

HOW TO ORDER

Please send me the OEL TTX 2000B Teletext Adapter @ £134.95 inc VAT and p&p.

I wish to pay by

☐ Access/Mastercharge/Eurocard Card No.

☐☐☐☐ ☐☐☐☐ ☐☐☐☐ ☐☐☐☐

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☐ Cheque/PO made payable to Database Publications Ltd.

Name ______________________

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Signed ______________________

Send to: *The Micro User,* FREEPOST,
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(No stamp needed if posted in UK)

Please allow 28 days for delivery

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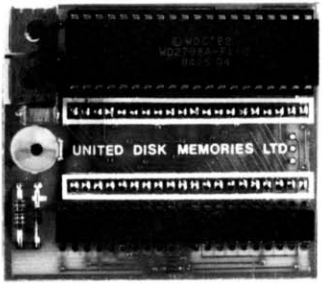
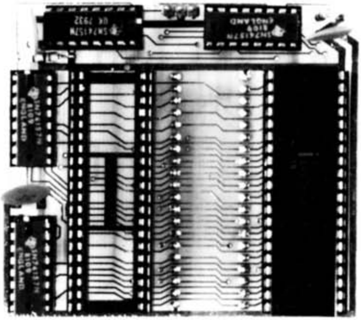
UDM DDFS





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4. THE "100%" BOARD AND SWITCH WITH 8271 AND TTL AND UDM DDFS.

END THE FRUSTRATIONS OF HAVING TO DECIDE WHICH FILING SYSTEM TO BUY..........

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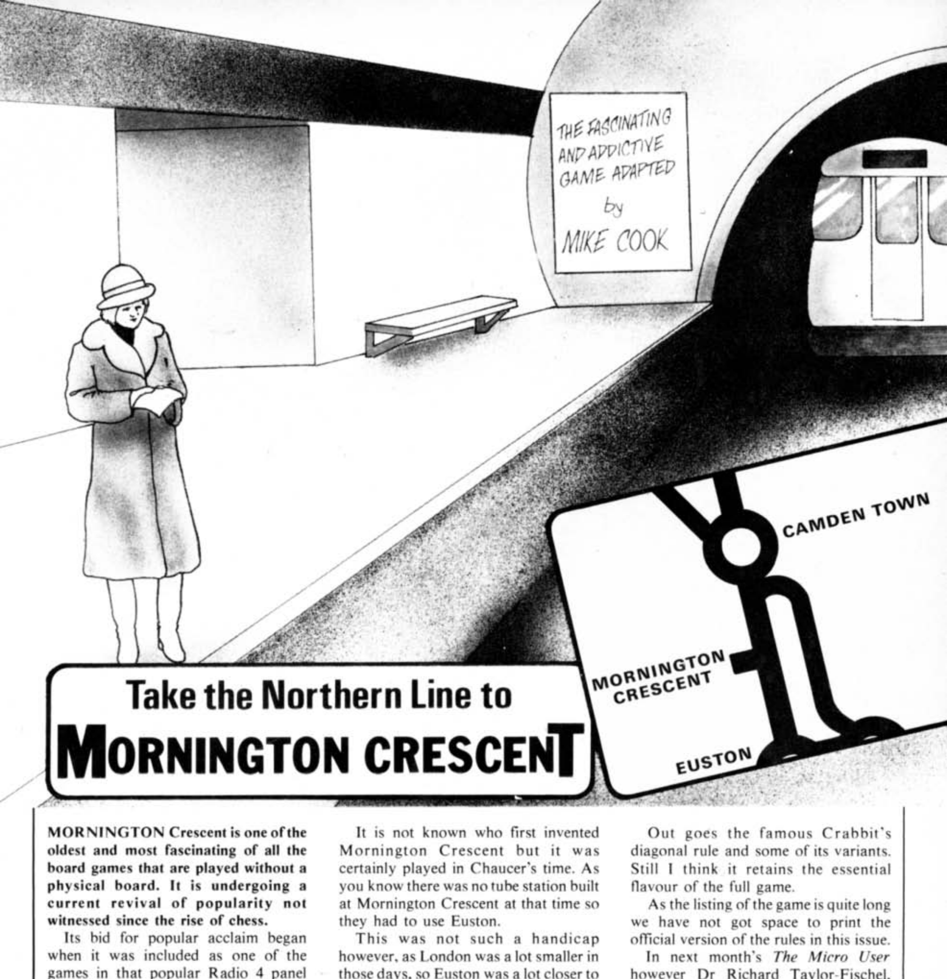
THE FASCINATING AND ADDICTIVE GAME ADAPTED by MIKE COOK
CAMDEN TOWN
MORNINGTON CRESCENT
EUSTON

Take the Northern Line to MORNINGTON CRESCENT

MORNINGTON Crescent is one of the oldest and most fascinating of all the board games that are played without a physical board. It is undergoing a current revival of popularity not witnessed since the rise of chess.

Its bid for popular acclaim began when it was included as one of the games in that popular Radio 4 panel game, I'm Sorry I Haven't A Clue. The almost hypnotic effect on the radio audience was immediately felt..

A lot of people were surprised to know that the simple nursery game we all played as children had a skilful and cunning side to it when played by masters.

Indeed, the Mornington Crescent Amateur World Championship held at Reykiavik, Iceland, attracted a record entry for the third year in succession. Unfortunately the original radio panel members have been banned from this as their amateur status has been removed after accepting money for doing the show.

It is not known who first invented Mornington Crescent but it was certainly played in Chaucer's time. As you know there was no tube station built at Mornington Crescent at that time so they had to use Euston.

This was not such a handicap however, as London was a lot smaller in those days, so Euston was a lot closer to Mornington Crescent than it is today.

Despite its immense popularity it is still difficult for people living in Watford and other remote parts of the country to find a skilled playing partner. Therefore, in conjunction with the English branch of the Society for the Support of Mornington Crescent, *The Micro User* brings you the first ever computer version of the game.

Due to the immense complexity of the full game, it is normally played with a referee who adjudges the exact rules and conditions. As this awaits the development of advanced artificial intelligence techniques, the computer version has had to be simplified.

Out goes the famous Crabbit's diagonal rule and some of its variants. Still I think it retains the essential flavour of the full game.

As the listing of the game is quite long we have not got space to print the official version of the rules in this issue.

In next month's *The Micro User* however Dr Richard Taylor-Fischel, one of the leading members of the society, will give a full account of the rules, together with hints and tips for playing.

Officially you are supposed to play the game from memory but a map of the London Underground system would be a benefit for those playing it for the first time.

You will see there is a lot of data in the listing to this game and it all has to be entered correctly. This will really be a test of your typing. If I were you I would invest in this month's cassette or disc.

→

From Page 121

```
    5 REM (C) The Micro User
   10 MODE7
   20 PRINTTAB(10,7);
   30 PROC_LOGO
   40 PRINT"MORNINGTON CRESCENT"
   50 PRINT"By Mike Cook"
   60 INPUT"Input your name",A$
   70 FOR A%=1 TO ASC(LEFT$(A$,1))+LE
N(A$)
   80 T%=RND(A%)
   90 NEXT
  100 PRINT"Well that's silly I won't
 bother"
  110 PROC_INT
  120 REPEAT
  130 I%=1
  140 Z%=4
  150 WHO%=0
  160 PRINT"Should I play by myself ?
";
  170 A$=GET$
  180 PRINT
  190 IF A$="Y" THEN PRINT "Ok I will
 be YOU":Q%=2:WHO%=1:A$="N":GOTO 230
ELSE Q%=1
  200 PRINT"Do you want to start (Y/N
) ?";
  210 A$=GET$:PRINT
  220 IF A$="Y" AND RND(10)>5 THEN PR
INT"TUFF I'm going first":A$="N"
  230 IF A$="Y" THEN PROC_YFM ELSE PR
OC_FMOVE
  240 CDIR%=0
  250 CS%=MS%
  260 REPEAT
  270 IF CLINE%<>0 THEN PRINT"Travell
ing ";D$(CDIR%);" the ";L$(CLINE%);"
line:-"
  280 IF WHO% THEN PRINT"You move to
"; ELSE PRINT"I move to ";
  290 PRINT S$(CS%)
  300 PRINT
  310 IF WHO% THEN PROC CMOVE ELSE PR
OC_YMOVE
  320 WHO%=WHO% EOR Q%
  330 I%=I%+1
  340 UNTIL CS%=13
  350 PRINT"Mornington Crescent "
  360 IF WHO% THEN PRINT "YOU WIN !!!
" ELSE PRINT "I WIN !"
  370 PRINT"Want another game ?"
  380 A$=GET$
  390 PROC_SPLIGE
  400 UNTIL A$="N"
  410 PRINT"I don't blame you I'm so
much better"
  420 END
  430 DEF PROC_MOVE(FH%)
  440 LOCAL A%,T%,TLINE%,TDIR%
  450 S%=1
  460 PROC_WIND(FH%)
  470 A%=1
  480 READ T%
  490 IF (T% AND &8000)<>0 THEN 530
  500 TRAVD%(A%)=T%
  510 A%=A%+1
  520 GOTO 480
  530 IF A%=2 THEN PROC_REC(TRAVD%(1)
):PROC_TRAVLE(TRAVD%(1) AND 511,Z%,(T
RAVD%(1) DIV 512) AND 1,TRAVD%(1) DIV
 1024):ENDPROC
  540 PRINT"Testing moves :-"
  550 FOR T%=1 TO A%-1
  560 TDIR%=(TRAVD%(T%) DIV 512) AND
1
  570 TLINE%=TRAVD%(T%) DIV 1024
  580 IF TLINE%=CLINE% AND TDIR%<>CDI
R% THEN 620
  590 PRINT CHR$(13);D$(TDIR%);" the
";L$(TLINE%);" Line";SPC(8);
  600 PROC_REC(TRAVD%(T%))
  610 PROC_TRAVLE((TRAVD%(T%) AND 511
),Z%,TDIR%,TLINE%)
  620 NEXT
  630 PRINT CHR$(13);CHR$(11);SPC(38)
  640 PRINT SPC(38);CHR$(13);CHR$(11)
;
  650 ENDPROC
  660 DEF PROC_YMOVE
  670 TRY%=2
  680 INPUT"INPUT YOUR MOVE ",SM$
  690 PROC_SFIND(SM$)
  700 IF TRY%<1 THEN PRINT "YOU LOSE
by failing to make a valid move":CS%=
13:WHO%=WHO% EOR 1:ENDPROC
  710 IF MS%=0 THEN PRINT"Concentrate
":GOTO 680
  720 IF MS%=?(W%+LEN($W%)) AND ((I%
DIV 2) AND 1) THEN PRINT"A brilliant
use of ";$W%;" rule":CS%=?(W%+LEN($W%
)):ENDPROC
  730 PROC_VALID(MS%)
  740 IF MS%=0 THEN TRY%=TRY%-1:PRINT
"WE ARE NOT USING CRABBITS RULE":GOTO
 680
  750 CS%=MS% AND 511
  760 CLINE%=MS% DIV 1024
  770 CDIR%=(MS% DIV 512) AND 1
  780 PRINT CHR$(11);SPC(38);CHR$(13)
;
  790 ENDPROC
  800 DEF PROC_VALID(TS%)
  810 PROC_MOVE(CS%)
  820 LOCAL A%
  830 MS%=0
  840 FOR A%=1 TO S%-1
  850 IF TS%=(S%(A%) AND 511) THEN MS
%=S%(A%)
  860 NEXT
  870 IF (CS%=38 OR CS%=39 OR CS%=40)
 AND TS%=&D THEN MS%=0
  880 ENDPROC
  890 DEF PROC_CMOVE
  900 LOCAL T%
  910 PROC_MOVE(CS%)
  920 FOR A%=1 TO S%-1
  930 IF (S%(A%) AND 511)=13 THEN MS%
=13
  940 NEXT
  950 IF MS%=13 AND CS%<(14+Z%) THEN
CS%=13:ENDPROC
  960 IF S%>2 THEN T%=RND(S%-1) ELSE
T%=1
  970 CS%=S%(T%) AND 511
  980 CDIR%=(S%(T%) DIV 512) AND 1
  990 CLINE%=S%(T%) DIV 1024
 1000 ENDPROC
 1010 DEF PROC_TRAVLE(TS%,DEPTH%,CDIR
%,CLINE%)
 1020 LOCAL MARK%,TEMPS%,T%
 1030 TEMPS%=S%
 1040 MARK%=S%
 1050 DEPTH%=DEPTH%-1
 1060 IF DEPTH%=0 THEN ENDPROC
 1070 PROC_WIND(TS%)
 1080 READ T%
 1090 IF (T% AND &8000) <> 0 THEN 112
0
 1100 IF (((T% DIV 512) AND 1)=CDIR%)
 AND ((T% DIV 1024)=CLINE%) THEN PROC
_REC(T%):MARK%=MARK%+1
 1110 GOTO1080
 1120 IF MARK%=TEMPS% THEN ENDPROC
 1130 PROC_TRAVLE((S%(MARK%-1) AND 51
1),DEPTH%,CDIR%,CLINE%)
 1140 MARK%=MARK%-1
 1150 GOTO 1120
 1160 DEF PROC_YFM
 1170 REPEAT
 1180 INPUT"Ok where do you want to s
tart ",SS$
 1190 PROC_SFIND(SS$)
 1200 UNTIL MS%<>0
 1210 WHO%=1
 1220 CLINE%=0
 1230 ENDPROC
```

```
1240 DEF PROC_SFIND(SS$)
1250 LOCAL A%
1260 MS%=0
1270 REPEAT
1280 MS%=MS%+1
1290 UNTIL MS%=N% OR S$(MS%)=SS$
1300 IF MS%<>N% THEN ENDPROC
1310 PRINT"Your station is not on my
list"
1320 PRINT"IS it one of the followin
g?"
1330 IF LEN(SS$)>4 THEN F%=4 ELSE F%
=LEN(SS$)
1340 REPEAT
1350 P$=LEFT$(SS$,F%)
1360 B%=1
1370 FOR A%=1 TO N%
1380 IF LEFT$(S$(A%),F%)<>P$ THEN 14
20
1390 PRINT STR$(B%);") ";S$(A%)
1400 S%(B%)=A%
1410 B%=B%+1
1420 NEXT
1430 F%=F%-1
1440 UNTIL F%=0 OR B%<>1
1450 PRINT STR$(B%);") ";"NONE OF TH
ESE"
1460 REPEAT
1470 INPUT"WHICH NUMBER ",MS%
1480 UNTIL MS%<=B%
1490 IF MS%=B% THEN MS%=0 ELSE MS%=S
%(MS%)
1500 ENDPROC
1510 DEF PROC_INT
1520 RESTORE 1830
1530 N%=277
1540 W%=3200
1550 DIM S$(N%),S%(60),L$(15),TRAVD%
(10),D$(1)
1560 A$="Hodgekiss'"
1570 FOR A%=1 TO N%-1
1580 READ S$(A%)
1590 NEXT
1600 RESTORE 2340
1610 FOR A%=1 TO 15
1620 READ L$(A%)
1630 NEXT
1640 $W%=A$
1650 READ D$(0),D$(1)
1660 ENDPROC
1670 DEF PROC_WIND(SN%)
1680 LOCAL T%
1690 RESTORE 2080
1700 SN%=SN% OR &8000
1710 REPEAT
1720 READ T%
1730 UNTIL T%=SN%
1740 ENDPROC
1750 DEF PROC_REC(T%)
1760 S%(S%)=T%
1770 S%=S%+1
1780 ENDPROC
1790 DEF PROC_FMOVE
1800 MS%=RND(N%-1)
1810 CLINE%=0
1820 ENDPROC
1830 DATA HIGH BARNET,TOTTERIDGE,WOO
DSIDE PARK,WEST FINCHLEY,MILL HILL EA
ST,FINCHLY CENTRAL,EAST FINCHLEY
1840 DATA HIGHGATE,ARCHWAY,TUFNELL P
ARK,KENTISH TOWN,CAMDEN TOWN,MORNINGT
ON CRESCENT,EUSTON,WARREN STREET,GOOD
GE STREET,TOTTENHAM COURT ROAD,LEICES
TER SQUARE,CHARING CROSS,WATERLOO,KEN
NINGTON,OVAL,STOCKWELL,CLAPHAM NORTH,
CLAPHAM COMMON
1850 DATA CLAPHAM SOUTH,BALHAM,TOOTI
NG BEC,TOOTING BROADWAY,COLLIERS WOOD
,SOUTH WIMBLEDON,MORDEN,ELEPHANT & CA
STLE,BOROUGH,LONDON BRIDGE,BANK,MOORG
ATE,OLD STREET,ANGEL,KING'S CROSS,CHA
LK FARM,BELSIZE PARK,HAMPSTEAD,GOLDER
S GREEN,BRENT
→ 1860 DATA HENDON CENTRAL,COLINDALE,B
URNT OAK,EDGWARE
1870 DATA RICHMOND,KEW GARDENS,GUNNE
RSBURY,TURNHAM GREEN,STAMFORD BROOK,R
AVENSCOURT PARK,HAMMERSMITH,BARONS CO
URT,WEST KENSINGTON,EARLS COURT,GLOUC
ESTER ROAD,SOUTH KENSINGTON,SLOANE SQ
UARE,VICTORIA,ST. JAMES'S PARK,WESTMI
NSTER
1880 DATA TEMPLE,BLACKFRIARS,MANSION
 HOUSE,CANNON STREET,MONUMENT,TOWER H
ILL,ALDGATE EAST,WHITECHAPEL,STEPNEY
GREEN,MILE END,BROW ROAD,BROMLEY-BY-B
OW,WEST HAM,PLAISTOW,UPTON PARK,EAST
HAM,BARKING,UPNEY,BECONTREE,DAGENHAM
HEATHWAY
1890 DATA DAGENHAM EAST
1900 DATAELM PARK,HORNCHURCH,UPMINST
ER BRIDGE,UPMINSTER,EALING BROADWAY,E
ALING COMMON,ACTON TOWN,CHISWICK PARK
? → ,WIMBLDON,WIMBLEDON PARK,SOUTHFIELDS,
EAST PUTNEY,PUTNEY BRIDGE,PARSONS GRE
EN,FULHAM BROADWAY,WEST BROMPTON,HIGH
 STREET KENSINGTON
1910 DATA NOTTINGHILL GATE,BAYSWATER
,PADDINGTON,EDGWARE ROAD
1920 DATA HOUNSLOW WEST,HOUNSLOW CEN
TRAL,HOUNSLOW EAST,OSTERLEY,BOSTON MA
NOR,NORTHFIELDS,SOUTH EALING,KNIGHTSB
RIDGE,HYDE PARK CORNER,GREEN PARK,PIC
CADILLY CIRCUS,COVENT GARDEN,ALDWYCH,
HOLBORN,RUSSELL SQUARE,CALEDONIAN ROA
D,HOLLOWAY ROAD
1930 DATA ARSENAL,FINSBURY PARK,MANO
R HOUSE,TURNPIKE LANE,WOOD GREEN,BOUN
DS GREEN,ARNOS GROVE,SOUTHGATE,OAKWOO
D,COCKFOSTERS,UXBRIDGE,HILLINGTON,ICK
ENHAM
1940 DATA RUISLIP,RUISLIP MANOR,EAST
COTE,RAYNERS LANE,SOUTH HARROW,SUDBUR
Y HILL,SUDBURY TOWN,ALPERTON,PARK ROY
AL,NORTH EALING
1950 DATA GOLDHAWK ROAD,SHEPHERDS BU
SH,LATIMER ROAD,LADBROKE GROVE,WESTBO
URNE PARK,ROYAL OAK,GREAT PORTLAND ST
REET,EUSTON SQUARE,FARRINGDON,BARBICA
N,ALGATE ?
1960 DATA WEST ACTON,NORTH ACTON,EAS
T ACTON,WHITE CITY,SHEPHERDS BUSH,HOL
LAND PARK,QUEENSWAY,LANCASTER GATE,MA
RBLE ARCH,BOND STREET,CHANCERY LANE,S
T. PAUL'S,BETHNAL GREEN,STRATFORD,LEY
TON,LEYTONSTONE,SNARESBROOK,SOUTH WOO
DFORD,WOODFORD
1970 DATA BUCKHURST HILL,LOUGHTON,DE
BDEN,THEYDON BOIS,EPPING,NORTH WEALD,
BLAKE HALL,ONGAR,RODING VALLY,CHIGWEL
L,GRANGE HILL,HAINAULT,FAIRLOP,BARKIN
GSIDE,NEWBURY PARK,GANTS HILL,WANSTEA
D
1980 DATA WATFORD JUNCTION,WATFORD H
IGH STREET,BUSHEY & OXHEY,CARPENDERS
PARK,HATCH END,HEADSTONE LANE,HARROW
& WEALDSTONE,KENTON,SOUTH KENTON,NORT
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H WEMBLEY,WEMBLEY CENTRAL,STONEBRIDGE
 PARK,HARLESDEN,WILLESDEN JUNCTION,KE
NSAL GREEN
 1990 DATA QUEEN'S PARK,KILBURN PARK,
MAIDA VALE,WARWICK AVENUE,EDGWARE ROA
D,MARYLEBONE,REGENT'S PARK,TRAFALGAR
SQUARE,LAMBETH NORTH
 2000 DATA STANMORE,CANONS PARK,QUEEN
SBURY,KINGSBURY,WEMBLEY PARK,NEASDON,
DOLLIS HILL,WILLESDEN GREEN,KILBURN,W
EST HAMSTEAD,FINCHLEY ROAD,SWISS COTT
AGE,ST. JOHN'S WOOD
 2010 DATA AMERSHAM,CHALFONT & LATIME
R,CHORLEYWOOD,RICKMANSWORTH,MOOR PARK
,NORTH WOOD,NORTHWOOD HILLS,PINNER,NO
RTH HARROW,WATFORD,CROXLEY
 2020 DATA WEST HARROW,HARROW ON-THE-
HILL,NORTHWICK PARK,PRESTON ROAD
 2030 DATA NEW CROSS GATE,NEW CROSS,S
URREY DOCKS,ROTHERHITHE,WAPPING,SHADW
ELL,SHOREDITCH
 2040 DATA BRIXTON,VAUXHALL,PIMLICO,S
EVEN SISTERS,TOTTENHAM HALE,BLACKHORS
E ROAD,WALTHAMSTOW CENTRAL
 2050 DATA DRAYTON PARK,HIGHBURY & IS
LINGTON,ESSEX ROAD
 2060 DATA WEST RUISLIP,RUISLIP GARDE
NS,SOUTH RUISLIP,NORTHOLT,GREENFORD,P
ERIVALE,HANGER LANE,LIVERPOOL STREET,
BAKER STREET,CHESHAM,OXFORD CIRCUS
 2070 DATA REDBRIDGE,EMBANKMENT
 2080  DATA 32769,1538,32770,1025,153
9,32771,1026,1540,32772,1027,1542,327
73,1542,32774,1029,1543,1028,32775,10
30,1544,32776,1031,1545,32777,1032,15
46,32778,1033,1547,32779,1034,1548,32
780,1035,1549,1065,32781,1036
 2090  DATA 1550,32782,1037,1551,1576
,9231,9768,32783,1038,1552,9490,9742,
32784,1039,1553,32785,1040,1554,5394,
5753,32786,1041,1555,3190,3703,32787,
1042,1812,2113,2626,8468,8822,10869,3
2788,1300,1557,8410,8980,11812
 2100  DATA 32789,1044,1558,1057,3279
0,1045,1559,32791,1046,1560,9470,9983
,32792,1047,1561,32793,1048,1562,3279
4,1049,1563,32795,1050,1564,32796,105
1,1565,32797,1052,1566,32798,1053,156
7,32799,1054,1568,32800,1055
 2110  DATA 32801,1058,1557,8922,3280
2,1059,1569,32803,1060,1570,32804,106
1,1571,5290,5903,11284,12358,32805,10
62,1572,4253,4879,7439,7837,13862,328
06,1063,1573,13349,14087,32807,1064,1
574,32808,1038,1575,3194,3707,4251
 2120  DATA 4764,7324,7835,9230,9990,
32809,1066,1548,32810,1067,1577,32811
,1068,1578,32812,1069,1579,32813,1070
,1580,32814,1071,1581,32815,1072,1582
,32816,1073,1583,32817,1584,32818,261
1,32819,2098,2612,32820,2099
 2130  DATA 2613,32821,2100,2614,2142
,32822,2101,2615,32823,2102,2616,3282
4,2103,2617,3165,3641,4756,32825,2104
,2618,3128,3643,32826,2105,2619,32827
,2106,2620,2150,2663,3129,3644,32828,
2107,2621,3131,3645,7741,7271
 2140  DATA 32829,2108,2622,3132,3699
,7228,7742,32830,2109,2623,7229,7743,
32831,2110,2624,7230,7744,9472,9845,3
2832,2111,2625,7231,7745,32833,2112,2
579,7232,7956,32834,2067,2627,7444,77
47,32835,2114,2628,7234,7748
 2150  DATA 32836,2115,2629,7235,7749
,32837,2116,2630,7236,7750,32838,2117
,2631,7237,7751,12836,32839,2118,2632
,7238,7752,32840,2119,2633,4367,4681,
7239,7951,32841,2120,2634,4168,4682,1
4588,15101,32842,2121,2635,4169
 2160  DATA 4683,32843,2122,2636,4170
,4684,5291,5804,32844,2123,2637,4171,
4685,32845,2124,2638,4172,4686,32846,
2125,2639,4173,4687,32847,2126,2640,4
174,4688,32848,2127,2641,4175,4689,32
849,2128,2642,4176,4690,32850
 2170  DATA 2129,2643,4177,32851,2130
,2644,32852,2131,2645,32853,2132,2646
,32854,2133,2647,32855,2134,2648,3285
6,2135,2649,32857,2136,2650,32858,213
7,32859,2652,5791,32860,2139,2653,321
9,3677,32861,2140,2654,3186
 2180  DATA 3640,3164,32862,2141,2613
,32863,2656,32864,2143,2657,32865,214
4,2658,32866,2145,2659,32867,2146,266
0,32868,2147,2661,32869,2148,2662,328
70,2149,2619,32871,2107,2664,7272,774
0,32872,2151,2665,5284,5797
 2190  DATA 7273,7783,32873,2152,2666
,7274,7784,32874,2153,2667,4249,4715,
7275,7785,8406,8917,32875,2154,4202,4
880,7440,7786,32876,3693,32877,3180,3
694,32878,3181,3695,32879,3182,3696,3
2880,3183,3697,32881,3184,3698
 2200  DATA 32882,3185,3677,32883,313
3,3700,32884,3187,3701,32885,3188,370
2,9279,10002,10259,10920,32886,3189,3
602,8211,8978,32887,3090,3705,32888,1
5481,32889,15993,3706,5137,5801,3191,
32890,3193,3624,32891,3112,3708
 2210  DATA 32892,3195,3709,32893,319
6,3710,32894,3197,3711,9478,9985,3289
5,3198,3712,32896,3199,3713,32897,320
0,3714,32898,3201,3715,32899,3202,371
6,32900,3203,3717,32901,3204,3718,329
02,3205,32903,3720,4744,32904
 2220  DATA 3207,3721,4231,4745,32905
,3208,3722,4232,4746,32906,3209,3723,
4233,4747,32907,3210,3724,4234,4748,3
2908,3211,3725,4235,4749,32909,3212,3
726,4236,4851,32910,3213,3727,32911,3
214,3728,32912,3215,3729,32913
 2230  DATA 3216,3730,32914,3217,3731
,32915,3218,3676,32916,4152,4757,3291
7,4244,4758,32918,4245,4759,32919,424
6,4760,32920,4247,4761,32921,4248,471
4,32922,4368,4763,7323,7952,32923,425
0,4648,7208,7834,32924,4136
 2240  DATA 4765,7325,7720,32925,4252
,4645,7205,7836,32926,4367,32927,5211
,5792,32928,5390,5793,5279,32929,5280
,5794,32930,5281,5795,32931,5282,5796
,32932,5283,5736,32933,5224,5798,3293
4,5285,5799,32935,5286,5800
 2250  DATA 32936,5287,5906,10357,110
24,32937,5241,5802,32938,5289,5668,32
939,5391,5707,32940,5195,5805,32941,5
292,5806,32942,5293,5807,5826,32943,5
294,5808,32944,5295,5809,32945,5296,5
810,6330,32946,5297,5811,32947
 2260  DATA 5298,5812,32948,5299,5813
,32949,5300,5814,32950,5301,6839,3295
1,6326,6840,32952,6327,6841,32953,632
8,32954,6331,6833,32955,6332,6842,329
56,6333,6843,32957,5310,6844,32958,53
11,5821,32959,5312,5822,32960
 2270  DATA 5313,5823,32961,5395,5824
,32962,5294,5907,32963,8388,32964,838
9,8899,32965,8390,8900,32966,8391,890
1,32967,8392,8902,32968,8393,8903,329
69,8394,8904,32970,8395,8905,32971,83
96,8906,32972,8397,8907,32973
 2280  DATA 8398,8908,32974,8399,8909
,32975,8400,8910,32976,8401,8911,3297
7,8402,8912,32978,8403,8913,32979,840
4,8914,32980,8405,8915,32981,8298,891
6,32982,8407,8810,32983,8464,8918,329
84,8466,8976,32985,32986,8225
 2290  DATA 8724,32987,10460,32988,10
461,10971,32989,10462,10972,32990,104
63,10973,32991,4342,4837,10464,10974,
32992,10465,10975,32993,10466,10976,3
2994,10467,10977,32995,10469,10978,32
996,32997,4319,4880,10470,10979,32998
,10471,10981
 2300  DATA 32999,10512,10982,33000,4
841,33001,4328,4842,4369,33002,4329,4
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843,33003,4330,4844,33004,4331,4845,4
338,33005,4332,4846,33006,4333,4847,3
3007,4334,4848,33008,4335,4852,33009,
4850,33010,4337,4844,33011,4237
 2310  DATA 4852,33012,4339,4853,4336
,33013,4340,4854,33014,4341,4831,3301
5,15097,33016,15097,33017,14584,15098
,14583,33018,14585,15099,33019,14586,
15100,33020,14587,14921,33021,14409,3
3022,9751,33023,9239,9984,33024,9471,
9791
 2320  DATA 33025,9342,9986,33026,947
3,9987,33027,9474,9988,33028,9475,330
29,13574,33030,9256,9854,13575,14085,
33031,13350,14086,33032,5897,33033,53
84,5898,33034,5385,5899,33035,5386,59
00,33036,5387,5901,33037,5388,5902
 2330  DATA 33038,5389,5792,33039,413
3,4766,4680,5156,5803,7240,7717,33040
,4203,4762,4325,7322,7787,8400,8919,1
0400,10983,33041,4841,33042,5288,5649
,8310,8920,9333,9743,33043,5314,5825,
33044,7233,7746,8212,8723,1043,1556,3
2768
 2340 DATA Northern,District,Piccadil
ly,Metropolitan,Central,Central,Circl
e,Bakerloo,Victoria,Jubilee,Waterloo
& City,Escalator Link,Highbury Branch
,East London,Piccadilly
 2350 DATA UP,DOWN
→ 2360 DATA 145,160,160,160,224,252,25
5,255,255,255,253,244,176,160,160
 2370 DATA 145,160,160,232,255,191,16
3,160,160,162,171,255,253,160,160
 2380  DATA 145,160,160,255,181,160,1
60,160,160,160,160,235,255,180,160
 2390 DATA 145,255,255,255,255,255,25
5,255,255,255,255,255,255,255,255
 2400 DATA 145,160,160,239,245,160,16
0,160,160,160,160,250,255,165,160
 2410 DATA 145,160,160,170,255,253,17
6,160,160,224,248,255,183,160,160
 2420 DATA 145,160,160,160,162,171,23
9,255,255,191,175,161,160,160,160
 2430 DEF PROC_LOGO
 2440 RESTORE 2360
 2450 FOR A%=1 TO 7
 2460 FOR B%=1 TO 15
 2470 READ T%
 2480 PRINT CHR$(T%);
 2490 NEXT
 2500 PRINT STRING$(15,CHR$(8));CHR$(
10);
 2510 NEXT
 2520 ENDPROC
 2530 DEF PROC_SPLIGE
 2540 CLS
 2550 FOR C%=1 TO 20
 2560 PRINT TAB(RND(25),RND(17));
 2570 PROC_LOGO
 2580 PRINT
 2590 NEXT
 2600 CLS
 2610 ENDPROC
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This listing is included in this month's cassette tape offer. See order form on Page 173.

Leigh Computer Systems

Authorised Acorn Service Centre. ACT and Ferranti Computer Dealer

CUMANA DISC DRIVES

	Inc VAT £
CSX 100	109.15
CSX 200	145.63
CSX 200D	151.17
CSX 400	173.04
CS 100	145.63
CS 200	175.78
CS 400	200.38
CS 100E	136.61
CS 200E	164.85
CS 400E	190.36
CS 200ED	175.78
CD 200	259.60
CD 400D	347.97
CD 400/S	327.75
CD 800/S	376.91
Note: CSX drives do not have power supply.	
DFS KIT	105.00

MONITORS

	Inc VAT £
PHILIPS 20MH GREEN	84.00
PHILIPS 20MH AMBER	89.00
PHILIPS IBM PC GREEN	105.00
DIGIVISION COLOUR (Special)	169.00
MICROVITEC 1431	189.00
MICROVITEC 1451	269.00
MICROVITEC 1441	398.00
MICROVITEC QL	275.00
SABA TV MONITOR (Special)	199.00
SABA TV MONITOR Remote	219.00
KAGA, SANYO, IBM + ACT MONITORS AVAILABLE	

COMPUTERS

	Inc VAT £
ACORN ELECTRON	199.00
BBC B	399.00
BBC B + DFS	469.00
SANYO 555	955.00
ADVANCE 128K	1248.90
ADVANCE 256K	1329.40
ACT MACHINES AVAILABLE ie. F1 APRICOT	

PERIPHERALS

	Inc VAT £
HCR PROGRAMMER	57.00
HCR 16K RAM BOARD with write protect (plugs into ROM socket)	36.80
EXTRA RAM	23.00
PAIR OF LVL JOYSTICKS	19.95
PRO-LINK INTERFACE	9.95
C12 BLANK TAPES	40
SPECTRUM INTERFACE II	19.95
TEAK MONITOR STAND	10.35
AMX Mouse	79.00

PRINTERS

DOT MATRIX	Inc VAT £
CANON PW1080A	309.00
CANON PW1156A	425.00
KAGA KP810	299.00
KAGA KP910	389.00
EPSON RX80	218.50
EPSON RX80 F/T	245.00
EPSON FX80	373.00
EPSON MX100	420.00
EPSON FX100	487.50
EPSON JX80	516.00
EPSON LQ1500	1019.00
MANNESMANN TALLY MT80	209.00
MANNESMAN TALLY MT180	665.00
STAR GEMINI 10X	218.00
STAR GEMINI 15X	324.00
EPSON SERIAL INTERFACE (8143)	41.00
EPSON SERIAL INTERFACE (8148)	64.00
PAPER (2000 sheets)	12.00
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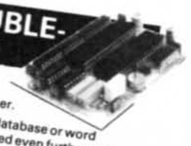

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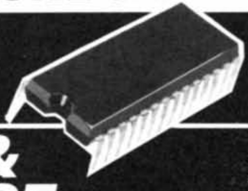

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These are a selection of the many letters that poured in after Acornsoft's Elite took a pounding from two readers in a recent issue of The Micro User.

The great Elite battle is joined

I CONFESS to being a little surprised at the readers' letters concerning the difficulty of Elite. Have we been playing the same game, I ask myself?

I'm no teenage key basher, far from it. I'm a middle-aged fairly clapped out clergyman who primarily uses the Beeb for word processing.

Rare spare time is normally spent wandering around Level 9 offerings or writing rude letters to Alice, but I did think I'd have a bash at Elite.

Result so far – Dangerous combat status (New Year resolution to become Deadly as soon as possible), 150,000 odd credits in the bank, and I now toddle between a rich industrial and a poor agricultural world trading in computers and doing the odd spot of bounty hunting around the poor A9. (feudal) world.

I honestly don't see what the early problems are (provided you can dock manually ok). I recently started from scratch to help a schoolfriend of my son's who can't manage the docking business.

I traded enough to buy him a docking computer without needing to fire a shot in anger – it simply needed careful selection of trading worlds and goods and took less than an hour.

My only gripes are that I've not got the disc version and so can't undertake missions and some local yokel beat me to Deadly status.

My only offering of advice to A.M.D. of Exeter is to treat everything as hostile at first, and to try combat at zero speed as far as his own ship is concerned. – **Rev. Bob Redrup, Truro, Cornwall.**

Frustration

AFTER reading A.M.D.'s letter I felt I must agree entirely. After all it is exciting but can get very frustrating when being attacked and watching your energy decrease every second.

I have found that whenever in this position I am tempted to hit Break.

Speaking on behalf of the "few pimpled schoolboys", it is very distressing when you have earned 160.0 cr, and you are saving up for a docking computer, slowly.

To earn enough to pay for one means you must make up to seven or eight trips between stations.

By then you have either crashed or mum is calling you for tea. It's impossible to dock more than three times on the run.

Can anyone invent a program that gives you enough money to buy a docking computer or gives you one?

Please help a poor 15-year-old schoolboy before I give Elite away. – **M. Williams, Ramsbottom, Greater Manchester.**

Inspiration

COME on Mr Lemon and A.M.D, are you men or mice? Elite is for the macho among us, and if you can't cope then you must resort to other tactics.

I started off with whiskey and ginger, but this was rather expensive and I kept falling asleep. Then inspiration struck me. A trip to the doctors obtained the biggest bottle of tranquillisers you can get. Pop in a couple and off you go. You'll still get zapped, but no longer care.

P.S. It worked for me, six hours a night for four weeks and now I'm competent. Now where's my prescription! – **B.G. Davey, Fareham, Hants.**

Illumination

WHILE engrossed in the Acornsoft Elite, stooging from space station to space station, improving my rating and earning oodles of boodle I find myself afflicted with a unique space complaint.

Having accumulated all this wealth and goodies, I decided that it was time to invest in a spot of insurance, so purchased an escape capsule. Lo and behold on taking possession, my flight instrument panel was transformed from its usual pleasant red, yellow, green combination to a harsh, but patriotic, red, white and blue.

Unfortunately this makes my compass dot white – which way do I fly? – and radar bogies white.

Mind you, there is a cure – jettison the capsule, after which, when the screen clears to status page the colour is back to normal.

Any reason or cure please? My version is on cassette. – **M.W. Tillett, Blaenau Ffestiniog, Gwynedd.**

Commiseration

HAVING bought Elite at the tender age of 31, I made Competent in two days and Dangerous four days later.

There I have stayed, probably due to the fact that I have the tape version which does not allow military lasers and I am working in keyboard mode only.

My commiserations with P.R. Lemon and A.M.D. I suspect I have met them on numerous occasions – in battle.

The best tip I can offer when being attacked by three or four nasties is to pick on one and chase him to the death (usually at fairly slow speed).

As his evasive pattern is computer generated, it is probably the best one around and as you are following his every move it is more difficult for the others to get a lead on you.

Remember that attack is the best form of defence. You get nowhere by running away.

Thank you Acornsoft for the best game ever for any Micro, and let's have more of this standard. – **Andrew Kerr, Dunfermline, Fife.**

Disillusion

I AM a "pimpled schoolboy" as described by a writer to your magazine in January's Micromail. I ordered Acornsoft's Elite as soon as I saw it advertised in The Micro User. It turned up 27 days later. This gave me two weeks before the end of October.

After this time I sent off my blue card (cassette version) saying that I had attained a rating of Deadly. Actually Deadly plus six "Right On Commanders" (you get one roughly every 256 kills and until Dangerous your rating rises every time you get one).

Two weeks later I reached Elite. I also learned I hadn't won the competition.

I can understand older people finding it hard. It took me 12 hours playing time to get familiar with the controls.

Now I find the game boring, although I understand that the disc version is more interesting (acts of heroism, more enemies etc.).

I would be interested in seeing an improved version perhaps in ROM, although I'm not sure of the feasability of this.

By the way, I am disleksic! (So any others like me don't be disheartened after reading the review). – **I. Powell, Whitchurch, Shropshire.**

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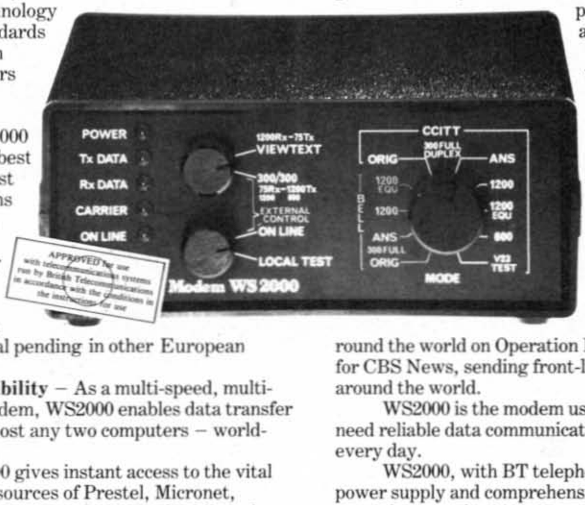
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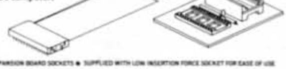

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Here's another piece of exclusive software to help you make the most of the versatile AMX Mouse, which is the subject of our special offer on Page 171

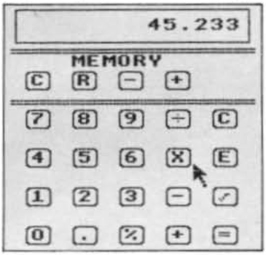
Kick the keyboard habit – move over to a mouse!

By GEOFF TURNER

LINKED with the appropriate software, the AMX Mouse can virtually eliminate the need for a keyboard on the BBC Micro.

As an example of how it can be put to good use, here is Mouse Calculator, which is as easy to operate as any simple pocket calculator.

Having loaded the program, you can put your keyboard to one side while you perform any number of calculations simply by moving your mouse cursor around the calculator keys.



I have included instructions (Listing I) for modifying the menu program provided in the AMX software package so that the calculator can be accessed directly from the menu.

If you do not wish to use the menu you must follow this procedure to load the calculator program. Type as direct commands:

```
*POINTER ON
*BREAK
```

This reserves memory for the pointer. The program may now be loaded with:

```
CHAIN "CALC"
```

If you wish to use the menu program to load the calculator you must amend it by changing the lines as shown in Listing I. Note that 6045 is a new line.

It may be a wise precaution to make a backup copy of your AMX cassette or disc before modifying the menu.

Type in Listing II, and save this to disc or cassette with a filename "CALC". Your mouse calculator is now ready to use.

Simply move the pointer over any of the calculator keys and press one of the mouse buttons – this, in effect, presses that calculator key. It performs like any pocket calculator, dealing with square roots and percentages as well as the usual mathematical functions.

Complex calculations may be performed by using the memory facility. The memory keys are situated across the top row, and an asterisk will light up when the memory contains any number.

A number entered in error may be cleared with the E key. If a calculation results in a number too large for the computer to handle an overflow message is generated and the calculator will freeze until the key C is pressed.

Full listing starts on Page 132

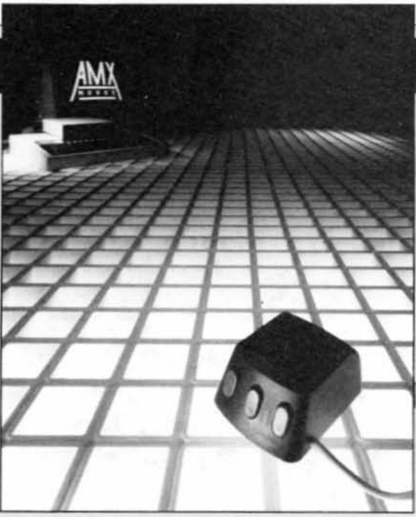
VARIABLES

BUTTON	Checks mouse buttons.
K%	Key pressed.
N	Number entered.
N$	String of number entered.
A	Accumulator.
A$	String of accumulator.
F%	Function key pressed.
M%	Memory key pressed.
memory	Number stored in memory.
length%	Length of N$.
point%	Status of decimal point.

PROCEDURES

PROCclear	Clears accumulator.
PROCresult	Displays result.
PROCmove	Moves pointer.
PROCbutton	Checks mouse buttons.
PROCkey	Checks calculator keys.
PROCnumber	Displays number entered.
PROCpoint	Accepts decimal point.
PROCfunction	Identifies function key.
PROCcalc	Calculates result.
PROCnextnumber	Clears last number entered.
PROCpercent	Calculates percentage.
PROCroot	Calculates square roots.
PROCmemory	Updates memory.
PROCoverflow	Deals with overflows.

Mouse calculator listing



From Page 131

Program I

```
  40 prog=51:art=53:calc=35
1050 PROCprog(calc,17,10,"CALC'R")
4015 IF N%<5 THEN 4020
6000 IF N%<0 OR N%>4 THEN GOTO 10
6045 IF N%=4 THEN CHAIN"CALC"
```

Program II

```
 10 REM ****************************
 20 REM *     MOUSE CALCULATOR     *
 30 REM * For use with BBC micro   *
 40 REM *      and AMX Mouse.      *
 50 REM * written by Geoff Turner *
 60 REM *   (C) The Micro User     *
 70 REM ****************************
 80 ON ERROR GOTO 2540
 90 REM SET UP SCREEN DISPLAY
100 MODE4
110 VDU23,240,0,8,0,127,0,8,0,0
120 VDU23,241,0,0,14,8,16,80,32,0
130 *DESK
140 *WINDOW 7,25,22,5
150 MOVE 224,719:DRAW 736,719
160 MOVE 224,711:DRAW 736,711
170 MOVE 224,591:DRAW 736,591
180 MOVE 224,583:DRAW 736,583
190 MOVE 240,740:DRAW 720,740
200 DRAW 720,820
210 DRAW 240,820
220 DRAW 240,740
230 PRINTTAB(4,5);"MEMORY"
240 FOR I%=1 TO 13 STEP 3
250 FOR J%=6 TO 18 STEP 3
260 PRINTTAB(I%,J%);
270 IF NOT(I%=13ANDJ%=6) THEN *ICON
76
280 NEXT
290 NEXT
300 VDU5
310 VDU29,224;192;
320 X=44:Y=76:MOVE X,Y:PRINT"0";
330 X=X+96:MOVE X,Y:PRINT".";
340 X=X+96:MOVE X,Y:PRINT"%";
350 X=X+96:MOVE X,Y:PRINT"+";
360 X=X+96:MOVE X,Y:PRINT"=";
370 Y=Y+96
380 X=44:MOVE X,Y:PRINT"1";
390 X=X+96:MOVE X,Y:PRINT"2";
400 X=X+96:MOVE X,Y:PRINT"3";
410 X=X+96:MOVE X,Y:PRINT"-";
420 X=X+96:MOVE X,Y:PRINTCHR$(241);
430 Y=Y+96
440 X=44:MOVE X,Y:PRINT"4";
450 X=X+96:MOVE X,Y:PRINT"5";
460 X=X+96:MOVE X,Y:PRINT"6";
470 X=X+96:MOVE X,Y:PRINT"X";
480 X=X+96:MOVE X,Y:PRINT"E";
490 Y=Y+96
500 X=44:MOVE X,Y:PRINT"7";
510 X=X+96:MOVE X,Y:PRINT"8";
520 X=X+96:MOVE X,Y:PRINT"9";
530 X=X+96:MOVE X,Y:PRINTCHR$(240);
540 X=X+96:MOVE X,Y:PRINT"C";
550 Y=Y+96
560 X=44:MOVE X,Y:PRINT"C";
570 X=X+96:MOVE X,Y:PRINT"R";
580 X=X+96:MOVE X,Y:PRINT"-";
590 X=X+96:MOVE X,Y:PRINT"+";
600 VDU4
610 VDU26
620 VDU23,1,0;0;0;0;
630 *SHOWPOINTER
640 PROCclear
650 PROCresult
660 memory=0
670 REM---------------------------
680 REM MAIN LOOP
690 REPEAT
700 BUTTON=0
710 PROCmove
720 PROCbutton
730 IF BUTTON=1 PROCkey ELSE 9150
740 IF K%<11 PROCnumber
750 IF K%=19 PROCclear
760 IF K%<15 AND K%>10 AND N>0 PROC
calc:PROCresult
770 IF K%<15 AND K%>10 PROCfunction
780 IF K%=15 AND N>0 PROCcalc:PROCr
esult:F%=5
790 IF K%=16 PROCpercent
800 IF K%=17 PROCroot
810 IF K%=18 PROCnextnumber
820 IF K%>19 AND K%<24 PROCmemory
830 REPEAT:UNTIL INKEY(-129)
840 UNTIL FALSE
850 END
860 REM---------------------------
870 REM MOVE POINTER
880 DEFPROCmove
890 REPEAT
900 *MOVEPOINTER
910 UNTIL NOT INKEY -129
920 ENDPROC
930 REM---------------------------
940 REM CHECK IF POINTER IN WINDOW
950 DEFPROCbutton
960 *UPDATE
970 IF POS<8 OR POS>21 THEN ENDPROC
980 IF VPOS<11 OR VPOS>24 THEN ENDP
ROC
990 IF POS=10 OR POS=13 OR POS=16 O
R POS=19 THEN ENDPROC
1000 IF VPOS=13 OR VPOS=16 OR VPOS=1
9 OR VPOS=22 THEN ENDPROC
1010 BUTTON=1
1020 ENDPROC
1030 REM---------------------------
1040 REM IDENTIFY KEY PRESSED
1050 DEFPROCkey
1060 IF POS<10 C%=1:GOTO 1110
1070 IF POS<13 C%=2:GOTO 1110
1080 IF POS<16 C%=3:GOTO 1110
1090 IF POS<19 C%=4:GOTO 1110
1100 C%=5
1110 IF VPOS<13 R%=1:GOTO 1160
```

```
1120 IF VPOS<16 R%=2:GOTO 1160
1130 IF VPOS<19 R%=3:GOTO 1160
1140 IF VPOS<22 R%=4:GOTO 1160
1150 R%=5
1160 K%=C%+(5*(R%-1))
1170 RESTORE
1180 FOR I%=1 TO K%
1190 READ K%
1200 NEXT
1210 IF K%<25 SOUND1,-10,200,1
1220 BUTTON=0
1230 DATA 20,21,22,23,24
1240 DATA 7,8,9,14,19
1250 DATA 4,5,6,13,18
1260 DATA 1,2,3,12,17
1270 DATA 0,10,16,11,15
1280 ENDPROC
1290 REM--------------------------
1300 REM DISPLAY NUMBER
1310 DEFPROCnumber
1320 PROCnextnumber
1330 N$=""
1340 IF LEN(N$)>length% THEN 1390
1350 IF K%<10 N$=N$+STR$(K%) ELSE IF
point%=0 PROCpoint
1360 PRINTTAB(9,7);SPC(13);
1370 PRINTTAB(22-LEN(N$),7);N$;
1380 REPEAT UNTIL INKEY(-129)
1390 REPEAT:PROCmove:PROCbutton:UNTI
L BUTTON=1
1400 PROCkey
1410 IF K%=10 AND point%=0 PROCpoint
1420 IF K%<11 THEN 1340
1430 N=VAL(N$)
1440 ENDPROC
1450 REM--------------------------
1460 REM PLACE DECIMAL POINT
1470 DEFPROCpoint
1480 point%=1:length%=9
1490 IF N$="" THEN N$="0." ELSE N$=N
$+"."
1500 PRINTTAB(9,7);SPC(13);
1510 PRINTTAB(22-LEN(N$),7);N$;
1520 ENDPROC
1530 REM--------------------------
1540 REM CLEAR ACCUMULATOR
1550 DEFPROCclear
1560 A=0:A$="0"
1570 N$="0"
1580 F%=1
1590 N=0:length%=8:point%=0
1600 PRINTTAB(9,7);SPC(13);
1610 PROCresult
1620 ENDPROC
1630 REM--------------------------
1640 REM IDENTIFY FUNCTION
1650 DEFPROCfunction
1660 F%=K%-10
1670 ENDPROC
1680 REM--------------------------
1690 REM CALCULATE RESULT
1700 DEFPROCcalc
1710 ON F% GOTO 1720,1730,1740,1750,
1780
1720 A=A+VAL(N$):GOTO 1760
1730 A=A-VAL(N$):GOTO 1760
1740 A=A*VAL(N$):GOTO 1760
1750 IF VAL(N$)<>0 A=A/VAL(N$) ELSE
PROCoverflow
1760 A$=STR$(A)
1770 N=0:N$=""
1780 ENDPROC
1790 REM--------------------------
1800 REM CLEAR REGISTER
1810 DEFPROCnextnumber
1820 N$="0"
1830 N=0:length%=8:point%=0
1840 PRINTTAB(9,7);SPC(13);
1850 PRINTTAB(22-LEN(N$),7);N$;
1860 ENDPROC
1870 REM--------------------------
1880 REM DISPLAY RESULT
1890 DEFPROCresult
1900 PRINTTAB(9,7);SPC(13);
1910 PRINTTAB(22-LEN(A$),7);A$;
1920 ENDPROC
1930 REM--------------------------
1940 REM CALCULATE PERCENTAGE
1950 DEFPROCpercent
1960 N=VAL(N$):A=VAL(A$)
1970 IF N>0 N=N/100 ELSE A=A/100
1980 N$=STR$(N):A$=STR$(A)
1990 PROCcalc
2000 PROCresult
2010 ENDPROC
2020 REM--------------------------
2030 REM CALCULATE SQUARE ROOT
2040 DEFPROCroot
2050 N=VAL(N$):A=VAL(A$)
2060 IF N>0 N=SQR(N) ELSE A=SQR(A)
2070 N$=STR$(N):A$=STR$(A)
2080 PRINTTAB(9,7);SPC(13);
2090 IF N>0 PRINTTAB(22-LEN(N$),7);N
$; ELSE PRINTTAB(22-LEN(A$),7);A$;
2100 ENDPROC
2110 REM--------------------------
2120 REM UPDATE MEMORY
2130 DEFPROCmemory
2140 M%=K%-19
2150 ON M% GOTO 2170,2210,2270,2350
2160 REM--------------------------
2170 memory=0
2180 PRINTTAB(21,11);" ";
2190 ENDPROC
2200 REM--------------------------
2210 N=memory
2220 N$=STR$(N)
2230 PRINTTAB(9,7);SPC(13);
2240 PRINTTAB(22-LEN(N$),7);N$;
2250 ENDPROC
2260 REM--------------------------
2270 IF N=0 AND A=0 ENDPROC
2280 PROCcalc:PROCresult:N=0:F%=5
2290 memory=memory-A
2300 IF memory=0 PRINTTAB(21,11);" "
;
2310 IF memory<>0 PRINTTAB(21,11);"*
";
2320 PROCclear
2330 ENDPROC
2340 REM--------------------------
2350 IF N=0 AND A=0 ENDPROC
2360 PROCcalc:PROCresult:N=0:F%=5
2370 memory=memory+A
2380 IF memory=0 PRINTTAB(21,11);" "
;
2390 IF memory<>0 PRINTTAB(21,11);"*
";
2400 PROCclear
2410 ENDPROC
2420 REM--------------------------
2430 REM DEAL WITH OVERFLOWS
2440 DEFPROCoverflow
2450 PROCclear
2460 PRINTTAB(9,7);SPC(13)
2470 PRINTTAB(8,7);"OVERFLOW.KEY.C"
2480 REPEAT:PROCmove:PROCbutton:PROC
key
2490 UNTIL K%=19
2500 PRINTTAB(8,7);SPC(13)
2510 ENDPROC
2520 REM--------------------------
2530 REM ERROR TRAPS
2540 IF ERR=20 PROCoverflow:GOTO 690
2550 PRINTTAB(0,0);
2560 REPORT:PRINT" at line ";ERL
2570 END
```

This listing is included in this month's cassette tape offer. See order form on Page 173.

Twillstar reliability for Home

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BBC Model B	£349.00
BBC Model B + Disc Interface	£419.00
BBC Model B + Econet Interface	£447.00
BBC Model B + Disc & Econet Interface	£517.00
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Electron	£129.00
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RAM-AMP 6 socket + 16K RAM	£57.00
6 Eprom socket + 32K RAM	£67.00
IX16K RAM Board	£38.00
Eprom Programmer (Blow all your BBC Eproms)	£49.00

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Modem	£148.00
Lead	£7.50
Auto-Dial	£34.00
Auto-Dial Cable	£4.50
Auto-Answer Card	£34.00

Telemod 2

Switchable modem between 1200/75 and 1200/1200 baud rate that allows you to communicate with services like Micronet, Prestel, Easylink or with other computer users at 1200 baud rate.

Modem	£84.00
Lead	£5.00
Software	£19.95

Telemod 3

BT approved – switchable between 75, 300/300, 1200/75, 75/1200 and allows you to communicate virtually anywhere in the world. It will allow you to communicate with services like Micronet, Telecom Gold, Prestel, One-to-One, Easylink, Microweb. It comes as a standard with built in board for auto-answer.

Modem	£170.00
Lead	£8.00
Software	£19.95

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BBC 3

Same as BBC 2 but with 400K drive £963.00

and Business computer users

BBC 4
BBC Mod. B + DFS, View or Wordwise, 800K Dual Disc Drive, High Res. Monitor, Juki 6100 daisywheel printer, 10 of 80 track Diskettes and all the necessary cables and printer paper £1,275.00

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(dual)	£5.00
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(dual)	£10.00

EXPANSION BOARDS

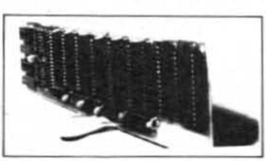
RAVEN-20 BOARD

The RAVEN-20 is a 20K RAM EXPANSION for the BBC Micro, Model B, fitted with O.S. 1.2.

This specially designed product plugs in to the CPU socket of your micro (centre socket of the 3 available) with the minimum of effort. The pins are specially custom made, thus avoiding any possible damage to the circuitry.

The RAVEN board provides the user with an extra 20K of usable RAM in screen modes 0 to 3. This together with the aid of software makes the system completely transparent to both the user and the computer.

The RAVEN-20 software ROM gives much more than just the standard commands, it has been programmed to give more and better commands! Priced at £69.95 inclusive of VAT. Please add £1.50 for post and packing.



RAM-ROM BOARD

The RAM-ROM extension board gives an extra 6 sockets for extra ROM's and 2 slots of RAM. This RAM is not an extension of BASIC. It is intended that the RAM be used to develop your own ROM based software. There are in fact seven sockets on the board, the 7th replaces the socket on the main board that would otherwise be taken by the ROM board. (The RAM-ROM board can accommodate both 2764 type EPROMS as well as 27128 EPROMS and ROM).

The RAMAMP board will not cause overheating. It comes with fully fitting instructions, tested and heat tested before despatch.

Prices: 1 x 16K RAM fitted £57.00. 2 x 16K RAM fitted £67.00.

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30 Hour BASIC (BBC Micro)	£6.95
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All prices inclusive of VAT. Please add £1.50 for P&P.

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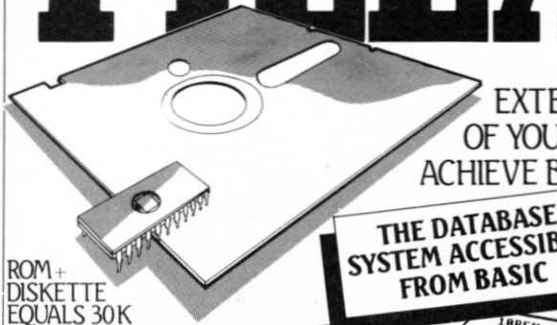
FILEAID



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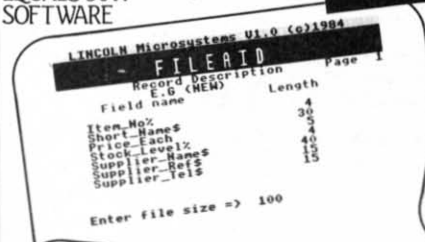
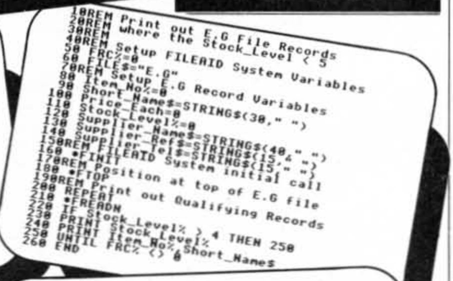
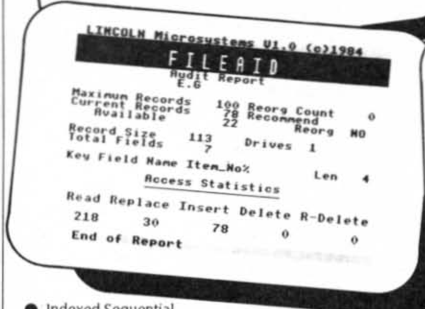


```
LINCOLN Microsystems V1.0 (c)1984
  -  F I L E A I D                 Page  1
         Record Description
          E.G (NEW)          Length
   Field name
                                4
 Item_No%                      30
 Short_Name$                    5
 Price_Each                     4
 Stock_Level%                  40
 Supplier_Name$                15
 Supplier_Ref$                 15
 Supplier_Tel$

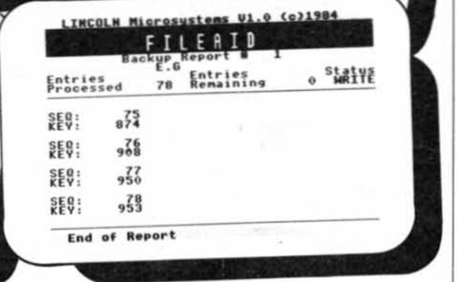
  Enter file size =)  100
```



```
10REM Print out E.G File Records
20REM where the Stock_Level < 5
30REM
40REM Setup FILEAID System Variables
50 FRC%=0
60 FILE$="E.G"
70REM Setup E.G Record Variables
80 Item_No%=0
90 Short_Name$=STRING$(30," ")
100 Price_Each=0
110 Stock_Level%=0
120 Supplier_Name$=STRING$(40," ")
130 Supplier_Ref$=STRING$(15," ")
140 Supplier_Tel$=STRING$(15," ")
150REM FILEAID System initial call
160 *FINIT
170REM Position at top of E.G file
180 *FTOP
190REM Print out Qualifying Records
200 REPEAT
210 *FREADN
220 IF Stock_Level% > 4 THEN 250
230 PRINT Stock_Level%
240 PRINT Item_No%,Short_Name$
250 UNTIL FRC% <> 0
260 END
```



```
LINCOLN Microsystems V1.0 (c)1984
          F I L E A I D
          Audit Report
             E.G
Maximum Records     100 Reorg Count      0
Current Records      78 Recommend
   Available         22          Reorg  NO
Record Size      113
Total Fields       7      Drives  1
Key Field Name Item_No%
                                Len     4
        Access Statistics
Read Replace Insert Delete R-Delete
 218     30     78      0       0
End of Report
```



```
LINCOLN Microsystems V1.0 (c)1984
          F I L E A I D
      Backup Report #   1
             E.G
Entries              Entries            Status
Processed      78    Remaining       0   WRITE

SEQ:       75
KEY:      874

SEQ:       76
KEY:      908

SEQ:       77
KEY:      950

SEQ:       78
KEY:      953

  End of Report
```

- Indexed Sequential Access (Random)
- Dynamic Memory Management
- Record Fields may be Integer/Real/String
- Random Access Functions:- READ/INSERT/REPLACE/ DELETE/ REVERSE - DELETE
- Sequential Access Functions:- TOP/BOTTOM/READNEXT/ READPREV
- Multiple Volume Support - Maximum 4 Drives
- Unlimited Number of Files per Program
- BACKUP/RESTORE Utilities
- Maximum Records per File 65,000
- Maximum Record Size 4096 Bytes
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P.O. BOX 74
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LINCOLN
Microsystems

Chatterbox listing

From Page 100

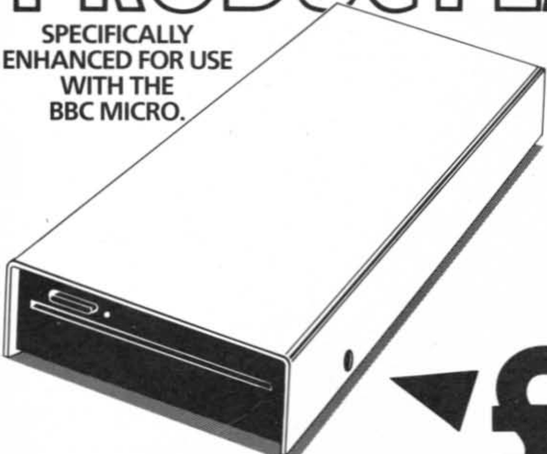
```
   10 MODE 7
   20 REPEAT
   30 CLS
   40 PRINT"THE MICRO USER PRESENTS"
   50 PRINT"CHATTER BOX - By Mike Coo
k"
   60 PRINT:PRINT
   70 PRINT"THE ACORN SPEECH SYSTEM M
UST BE FITTED"
   80 PRINT
   90 PRINT"1 - Multiplacation Tables
"
  100 PRINT"2 - Memory Game"
  110 PRINT
  120 PRINT"    YOU CHOSE? ";
  130 A=GET AND 3
  140 IF A=1 THEN PROC_MULT
  150 IF A=2 THEN PROC_GAME
  160 UNTIL FALSE
  170 DEF PROC_MULT
  180 PRINT
  190 REPEAT
  200 PRINT
  210 INPUT"WHAT TABLES SHOULD I SAY"
,N
  220 PROC_TABLES(N)
  230 PRINT
  240 PRINT"CONTROL Q TO QUIT ANY KEY
 FOR MORE"
  250 A=GET
  260 UNTIL A=17
  270 ENDPROC
  280 DEF PROC_GAME
  290 PRINT:PRINT
  300 PRINT"CONTROL Q TO QUIT AT END
OF GAME"
  310 SCORE$=CHR$(275)+CHR$(204)+CHR$
(257)+CHR$(131)
  320 NO$=CHR$(129)+CHR$(226)+CHR$(26
7)+CHR$(229)+CHR$(134)+CHR$(283)
  330 INV$=CHR$(128)+CHR$(272)+CHR$(1
43)+CHR$(274)+CHR$(267)+CHR$(229)+CHR
$(134)+CHR$(128)
  340 OK$=CHR$(128)+CHR$(202)+CHR$(29
0)+CHR$(180)+CHR$(128)+CHR$(128)+CHR$
(228)
  350 SCOREND$=""
  360 RESTORE 610
  370 READ N
  380 FOR A=1 TO N
  390 READ B
  400 SCOREND$=SCOREND$+CHR$(B)
  410 NEXT
  420 REPEAT
  430 N=0
  440 REPEAT
  450 N=N+1
  460 PROC_PHRASE(INV$)
  470 PROC_POSE(N)
  480 PROC_FIN
  490 *FX21,0
  500 T=1
  510 REPEAT
  520 G=GET AND 15
  530 PROC_SAY(G)
  540 IF G=(ASC(MID$(Q$,T,1)) AND 15)
 THEN T=T+1 ELSE PROC_NO(N):T=N+2
  550 UNTIL T>=N+1
  560 IF T=N+1 THEN PROC_PHRASE(OK$)
  570 UNTIL T=N+2
  580 PROC_PHRASE(SCORE$)
  590 PROC_SAY(N-1)
  600 PROC_PHRASE(SCOREND$)
  610 DATA 13,243,134,270,271,128,128
,128,143,272,162,246,168,212
  620 *FX21,0
  630 UNTIL GET=17
  640 ENDPROC
  650 DEF PROC_NO(N)
  660 PROC_PHRASE(NO$)
  670 FOR A=1 TO N
  680 PROC_PHRASE(MID$(Q$,A,1))
  690 NEXT
  700 ENDPROC
  710 DEF PROC_POSE(N)
  720 Q$=""
  730 FOR A=1 TO N
  740 B=RND(10)-1
  750 PROC_SAY(B)
  760 Q$=Q$+CHR$(B+48)
  770 NEXT
  780 ENDPROC
  790 DEF PROC_PHRASE(P$)
  800 LOCAL A,B
  810 FOR A=1 TO LEN(P$)
  820 B=ASC(MID$(P$,A,1))
  830 IF B<36 THEN B=B+256
  840 SOUND -1,B,0,0
  850 NEXT
  860 ENDPROC
  870 DEF PROC_TABLES(N)
  880 FOR A=1 TO 12
  890 PROC_SAY(A)
  900 SOUND -1,271,0,0:SOUND -1,134,0
,0
  910 PRINT A;" X ";N;
  920 PROC_FIN
  930 PROC_SAY(N)
  940 SOUND -1,209,0,0
  950 PROC_FIN
  960 PROC_SAY(A*N)
  970 PRINT " = ";A*N
  980 PROC_FIN
  990 TIME=0
 1000 REPEAT :UNTIL TIME>120
 1010 NEXT
 1020 ENDPROC
 1030 DEF PROC_FIN
 1040 REPEAT
 1050 UNTIL ADVAL(-9)=63
 1060 ENDPROC
 1070 DEF PROC_SAY(N)
 1080 LOCAL A,A$
 1090 IF N=0 THEN SOUND -1,139,0,0:EN
DPROC
 1100 IF N<0 THEN N=ABS(N):SOUND -1,2
19,0,0
 1110 IF N=INT(N) THEN 1240
 1120 PROC_SAY(INT(N))
 1130 SOUND -1,243,0,0
 1140 A$=STR$(N)
 1150 A=0
 1160 REPEAT
 1170 A=A+1
 1180 UNTIL MID$(A$,A,1)="."
 1190 REPEAT
 1200 A=A+1
 1210 PROC_SAY(VAL(MID$(A$,A,1)))
 1220 UNTIL A=LEN(A$)
 1230 ENDPROC
 1240 IF N<100 THEN PROC_NUM(N):ENDPR
OC
 1250 IF N>999 THEN PROC_SAY(N DIV 10
00):SOUND -1,141,0,0:N=N MOD 1000
 1260 IF N>99 THEN PROC_SAY(N DIV 100
):SOUND -1,140,0,0:N=N MOD 100
 1270  IF N<>0 THEN SOUND -1,165,0,0
 1280  IF N>0 THEN PROC_SAY(N)
 1290 ENDPROC
 1300  DEF PROC_NUM(N)
 1310 IF N>99 OR N<1 THEN ENDPROC
 1320 IF N=10 THEN SOUND -1,264,0,0:E
NDPROC
 1330 IF N=11 THEN SOUND -1,190,0,0:E
NDPROC
 1340 IF N=12 THEN SOUND -1,273,0,0:E
NDPROC
 1350  IF N>19 THEN SOUND -1,((N DIV
10) +32),0,0:SOUND -1,137,0,0: N=N MO
D 10
 1360 IF N>12 THEN SOUND -1,((N MOD 1
0) +32),0,0:SOUND -1,135,0,0:ENDPROC
 1370 IF N=0 THEN ENDPROC
 1380 SOUND -1,N+48,0,0
 1390 ENDPROC
```

This listing is included in this month's cassette tape offer. See order form on Page 173.

CHASE DATA

NEW

PRODUCT LAUNCH



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Specifications:
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All canon 40/80 switchable disc drives feature an on-board dual-colour LED on the front panel to show track mode selected. This is coupled with our own unique two-stage illumination. To give a clear operating status, as follows.

40 TRACK MODE:	LED GREEN
80 TRACK MODE:	LED RED
POWER ON:	HALF-ILLUMINATION *(GREEN OR RED)*
DRIVE SELECTED:	FULL-ILLUMINATION *(GREEN OR RED)*

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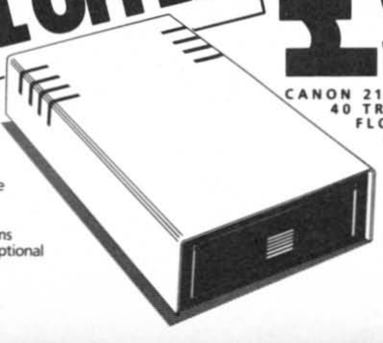
40 TRACK D/SIDED 200K
FLOPPY DISK DRIVE
DIRECT DRIVE**



Specifications:
40 track double sided disc drive
capacity 200k in single density
Operates in double density
Track to track access time – 6 ms
Full 12 month warranty with optional extended warranty available

Price Includes:
Drive cased with cables, manual & utilities disc and includes VAT, postage & packing.

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40 TK DS DD	**£24.50**	**£22.50**
80 TK DS DD	**£28.60**	**£26.60**

These prices include VAT & P & P.

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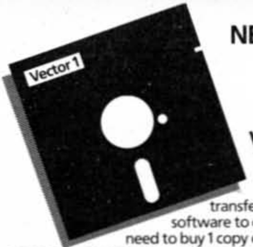
Tests: Motor speed, read/write, steptest, alignment test*, step & read/write test, read only test.

£8.00 inc. **£7.00** if purchased with disc drive.

*This test requires and oscilloscope & alignment disc.



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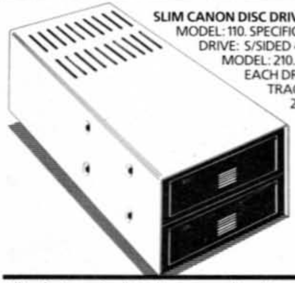
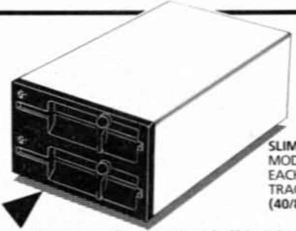
Vector 2 allows you to make backup copies of all your valuable disk software. It is the most advanced utility of its kind available. It is a condition of sale that neither of these products are used for infringement of copyright.

Not compatible with double density interface.

Vector 1 **£16** On its own
£15 If purchased with disk drive
Vector 2 **£16** On its own
£15 If purchased with disk drive



SLIM CANON DISC DRIVES:
MODEL: 110. SPECIFICATION OF EACH DRIVE: S/SIDED 40 TRACK 100K. MODEL: 210. SPECIFICATION OF EACH DRIVE: D/SIDED 40 TRACK 200K. MODEL: 220. D/SIDED 80 TRACK 400K. **(40/80 TRACK SWITCHING)**



SLIM SANYO DISC DRIVES:
MODEL: 596D. SPECIFICATION OF EACH DRIVE: D/SIDED 40/80 TRACK 400K.
(40/80 TRACK SWITCHING)

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All inclusive price list: This means: disc drive + case + all power & data cables + UK carriage + utilities disc & manual + VAT.

	CANON				SANYO
Model	**110**	**210**	**220**	**221A**	**596D**
Formatted Capacity per drive on BBC Micro:	100K	200K	400K	400K	**400K**
Single Drive & Case:	£85	£95	£149	£154	**£149**
Single Drive & Case PSU:	£110	£120	£174	£179	**£174**
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MIKE COOK builds a hi-resolution A/D converter

Slow and steady wins the race

YOU must all know the story of the tortoise and the hare – about the slow ponderous beast and the zippy fast young thing. Well in some ways it is the tortoise I want to look at this month.

It is almost a year since my article about a fast A/D (analogue to digital) converter. That's the hare. Now we are going to look at a slow A/D converter – the tortoise.

It's not for people who can't stand the pace but for those who require more haste and less speed.

You see the fast A/D could sample a voltage about 83,000 times a second, whereas the one we will look at this month can only go at about 3 samples a second.

So why bother? Simple: the fast A/D had a resolution of 1 part in 256, or about 0.4 per cent, whereas this one has 1 part in 20,000, or about 0.003 per cent.

Not only that, but the fast A/D gave you the voltage in arbitrary units just like the built-in analogue input port. This one gives you the reading in volts and allows you to measure positive or negative voltages.

The built-in converter will only give you about 10 bits of accuracy – that is, 1 part in 1,024 – and even then the results tend to drift with temperature. So if you need a stable, accurate method of measuring voltages, this is for you.

There are many different ways of performing a digital to analogue conversion. In most cases we have a three way trade-off between cost, accuracy and speed.

The computer's own A/D makes a good compromise but it is not suited to all situations. There are several digital voltmeter chips on the market, most of which are intended to be wired up into instruments and interfaced directly to a display.

However, one stands out among the crowd, not only for producing 4-bit BCD (binary coded decimal) outputs, but also for having a good resolution of four and a half digits.

The chorus of "What on earth is half a digit?" is no sooner starting than I am explaining. It's strange a funny voice does not come out so well in print.

A full digit is one that can take any value from zero to nine. A half digit is one that can only have the values zero and one. I know that's more like a fifth of a digit but I don't make up the rules.

Therefore, with four and a half digits our output is going to range between 0 and 19999. Of course these are in units which are proportional to the reference voltage we feed into the device.

Full scale is twice the reference voltage. So if we make it 1 volt the resulting outputs will measure directly up to 1.9999 volts.

Before we see how to make one, let's look at the theory. The method we will use is known as the dual ramp method and is the same as that used in the computer's own A/D.

Consider Figure I. This shows an integrator whose input is switchable between two voltages. Its output is fed to an inverting buffer to get the signal the right way up.

Remember that an integrator produces a rising voltage or a ramp when fed with a steady voltage. The larger the voltage the faster the ramp will climb.

So we switch the integrator over to the unknown voltage for a fixed length of time. When the time is up, the output of the integrator will have risen to a level proportional to our unknown voltage. For a large voltage it will be high, and for a small voltage it will be low. The slope of the ramp is dependent upon the input voltage.

Then, we switch the integrator's input to a negative reference voltage. This causes it to ramp downwards. As the reference voltage is always the same this time, it will ramp down with a constant slope.

If we time how long it takes to drop to

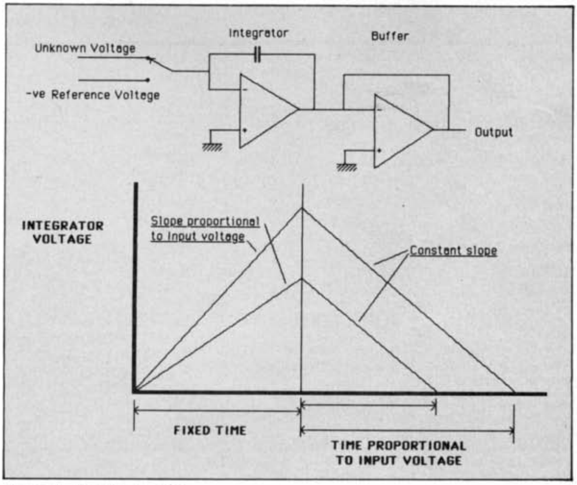
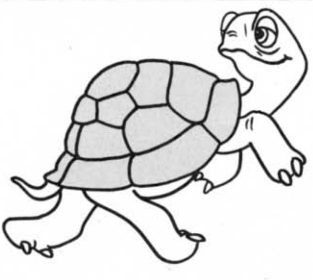


Figure I: Dual Ramp A/D



THE BEEB BODY BUILDING COURSE

Part 25

zero we have a measure of how high it was to start with. This is rather like measuring the depth of a well by dropping a stone and timing the splash, or the cries of an intrepid potholer.

Now, it is very easy to measure time digitally. We just count how many cycles of a fixed frequency oscillator have occurred and we know the time.

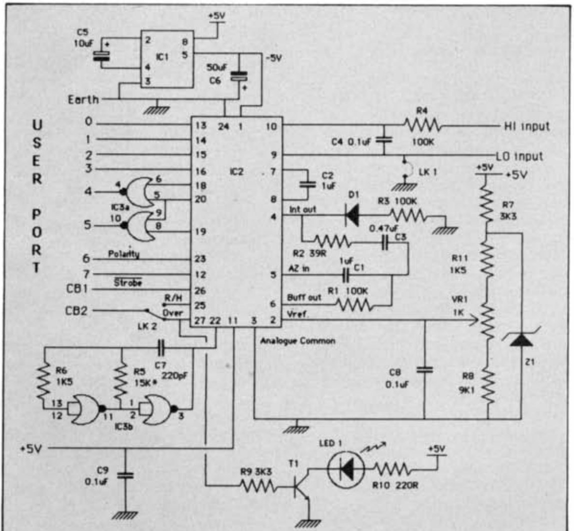
If we use the same oscillator to time the ramp up period we don't even have to know what the frequency is. We have a measure of the voltage merely as a ratio of the two times.

All that is required of the oscillator is that it has short term stability and all will be well.

Finally, there is an auto zero phase when the integrator is switched to zero volts. This allows compensation for any offset voltages in the various internal amplifiers.

Offset voltages are small voltages present on the input of amplifiers even when there is no signal present. These get added to any input signal and tend to give what is called a DC offset on the outputs. Without this form of compensation, accuracy would be severely limited.

Basically that is what is going on inside Digital Voltmeter (DVM) ICs. So let's see what else we need to hang around it to achieve a working system.



*SEE TEXT

IC1 - ICL7660 IC2 - ICL7135 IC3 - 4001 Z1 - ICL 8069

T1 - BC337 or similar D1 - 1N4144

Figure II: Digital Voltmeter

The full circuit of our DVM board is shown in Figure II. The circuitry consists of two halves – the analogue side (right) and the digital side (left). The integrating capacitor C3 is the critical one.

For standard results polystyrene or polycarbonate can be used, but for the ultimate in accuracy polypropylene capacitors should be used. Unfortunately these can cost up to £4 each so I would try an ordinary one first.

The various other components around pins 4 to 8 are all concerned with the integration or auto zero. Pin 2 has the reference voltage and is fed from a band gap voltage regulator IC. This is temperature compensated and quite stable. It produces 1.2 volts and so resistors R11, R9 and VR1 tap this down to the 1 volt needed.

Note that for fine adjustment VR1 should be a multi-turn helical pot. This type gives ten turns or so over its whole range, thus allowing very accurate setting up.

You might have some software already compensating for the 1.8 volts reference in the BBC Micro. If you want to use the same reference voltage with this DVM board you should change R8 to about 6K8 to allow the reference to be set at 0.9 volts.

The two inputs to the DVM are marked HI and LO and should be connected to the high side and low side of what you want to measure. These terms are, of course, relative and LO should be taken as being close to the signal ground.

There is on the board an optional wire link labelled LK1 which ties the LO input to the system common and thus to earth. This is the most conventional way of using the board and so this link should be made unless you have specific reasons for wanting it to be open.

At the input, R4 and C4 form a filter to remove any high frequency noise. At the rate of conversion of the DVM it will not affect us. However if you are

→

From Page 141

measuring higher voltages, C4 can be replaced with a resistor to cut down the input. This will of course reduce the input impedence of the DVM to that of the potential divider.

Finally, on the analogue side, the analogue earth is brought out on a different pin from the digital earth. If you are laying this out yourself make sure there are no heavy digital (fast changing) currents flowing in the analogue common wiring.

Of course the analogue and digital grounds are connected together electrically but you shouldn't mix them. This means there should be separate digital and analogue structures, just linked at one point.

Now on the digital side we must supply the DVM chip with a negative voltage supply. As this chip takes rather a lot of current we cannot use the trick of generating a negative supply from the clock oscillator as we did with the fast D/A converter. Instead the best solution is to use a negative supply generator chip – this is IC1.

It uses the same principle as we used before, namely an oscillator feeding into a capacitor and the output being rectified. But the charging and discharging switches are a lot more efficient.

You could power the chip off the –5V output from the computer's auxiliary power socket, then you could eliminate this chip. However it is included to make a neat unit only requiring a connection to the user port.

Two gates of IC3 are used as a feed-back oscillator. R5 determines the frequency and hence the conversion time. The value shown will produce about two and a half readings every second. You can push this up to about four a second by making R5 10K.

If you make it any faster you can get a pedestal or constant offset reading imposed on the output. This can be subtracted quite easily with software if you want faster times. With the components shown the clock should be at about 100KHz, but it can be increased up to 1MHz.

The signals are multiplexed at the output. That is, the digits are constantly changing – first the bits of the first digit and then the bits of the next digit and so on. These outputs are connected to the first 4 bits of the user port.

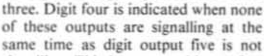
In order to know which bit is currently being produced one of five outputs on the DVM chip goes low. Each output signals its own digit.

As we have only eight inputs on the user port and are already using four for the values we have to be a little cunning. The output line marking the fifth digit is connected to bit 7 of the user port but the others are mixed by two gates to give a unique combination on bits 4 and 5 of the user port for each of the four other digits.

It turns out we don't even need to use the digit four signal, just one, two and three. Digit four is indicated when none of these outputs are signalling at the same time as digit output five is not signalling. This leaves us with one free user port line, bit 6, which is used to look at the polarity of the signal.

In order to read in the signals the DVM chip produces a strobe pulse for each of the digits the first time they appear after a conversion. This is connected to control line 1 of the user port and is used to generate an interrupt which causes the computer to read the new value.

Finally we come to control line 2. Unfortunately we have two useful lines that could be connected here. One is the over-range output and the other is the RUN/HOLD input. Link LK2 allows you to choose which you connect up.



I have written the software around the over-range connection which produces an interrupt when the DVM is being fed with more voltage than it can cope with. The reading under this condition will be zero and not full scale like the BBC's A/D converter. Also this output feeds an LED which will flash when there is an over-range condition.

Alternatively, if you connect control line 2 to the RUN/HOLD input you will have to program the VIA to make control line 2 an output. When it is held low the DVM will not produce any more conversions and will continue to give the same reading.

A short positive pulse – you can't generate one too short with the BBC Micro – will initiate a new conversion. If it is held high or not connected the DVM will "free run", giving a continual stream of conversions.

I have laid out a printed circuit board for the DVM which can be obtained along with all the components as Body Build Pack No. 22. Construction should present no difficulty, but for those of you with little experience the pack contains a sheet on constructional tips. The DVM is also available ready made and calibrated. (Details on page 117.)

Well, the job is only half done without the software, and this is shown in Listing I. It is basically an interrupt-driven background task, designed to be installed in the computer and then forgotten.

It will go on taking readings and placing them in memory. When you want them you simply read in the appropriate memory location.

While it is located in my favourite place, the RS432 buffer, it can be moved to any protected memory location. The only lines which need to be changed are 90, 1060, 1070 and 1130.

Basically the program is split into two parts, one that initialises the patch and one that reads the DVM. The first part intercepts the unrecognised interrupt vector and routes it into the reading routine. It also initialises the VIA and prepares some memory locations.

When the DVM generates an interrupt, the read routine labelled RDVM is executed. This tests to see if it is a new reading or an over-range interrupt.

Assuming it is a new reading, it takes the reading and places the four least significant bits in a page zero memory location. It finds out what location by looking at the digit indicator signals on bits 4, 5 and 7.

When the last digit of a sample has been read in, the binary values are transferred to a memory location labelled VSTRING. On the way they are converted into Ascii characters so that they form a voltage string – hence the label name.

This is done so that the BASIC VAL command can convert them into a number the computer can use, which is by far the easiest way of doing the conversion. Also this technique prevents a BASIC program reading in a partially updated value.

If the interrupt was caused by an over-range condition the program produces a short bleep. The rest of the program is a short loop which will continually display the current reading. Now the patch is installed you can look at the reading any time by pressing function key f0.

The Break key has also been reprogrammed to re-initialise the patch. To completely remove it, you should press Ctrl and Break.

Having obtained a display of the readings it is now time to calibrate the DVM. What you need is a known voltage source or a way of measuring one. Simply connect it up and adjust the pot VR1 until the reading is correct.

Remember the absolute accuracy of a reading is usually not as important as the relative accuracy, so if you do not have an accurately known voltage source it is not such a disaster. You can even use the voltage reference on the DVM board.

The junction of R7 and R11 should be at 1.2 volts. I have a specially precise voltage cell for my calibration. Do not use an ordinary battery unless you monitor the voltage with another meter as the output is not exactly what is printed on the case.

Well there you have it, a digital voltmeter for all your serious data logging applications, which is as precise as you can get for a computer this side of £300.

See you next month.

```
   10 MODE7
   20 PRINT"THE BEEB BODY BUILDING COURSE"
   30 PRINT"4\ Digit DIGITAL VOLTMETER"
   40 PRINT"By Mike Cook"
   50 PRINT
   60 PRINT"DVM Reading Background Task Patch"
   70 PRINT"Press any key to continue"
   80 A=GET
   90 CODE%=&A00
  100 IF ?&207=&A THEN GOTO 1020
  110 FOR C%=0 TO 3 STEP 3
  120 P%=CODE%
  130 [
  140 OPT C%
  150 .INSTAL LDA #0
  160 STA &FE62 \ MAKE USER PORT INPUTS
  170 LDA &FE6C
  180 AND #15 \SET UP CONTROL LINES
  190 STA &FE6C
  200 LDA #13
  210 STA VSTRING+7
  220 LDA #&FE \ ASCII (-&30) FOR DECIMAL POINT
  230 STA &74
  240 SEI \DISABLE INTERRUPTS
  250 LDA &206
  260 STA TEMP \MOVE VECTORS
  270 LDA &207
  280 STA TEMP+1
  290 LDA #(RDVM MOD 256)
  300 STA &206
  310 LDA #(RDVM DIV 256)
  320 STA &207
  330 CLI
  340 LDA #&98 \ENABLE INTERRUPT
  350 STA &FE6E
  360 RTS
  370 .TEMP NOP
  380 NOP
  390 .VSTRING
  400 NOP:NOP:NOP:NOP:NOP:NOP:NOP
  410 NOP:NOP:NOP
  420 .RDVM PHA \ READ THE DVM
  430 TXA :PHA
  440 TYA :PHA
  450 LDA &FE6D \ INTERRUPT FLAG REG
  460 ASL A \ PUT BIT 7 INTO CARRY
  470 BCC RECOVER \NOT A USER PORT INTERRUPT
  480 ASL A :ASL A : ASL A \PUT CB1 FLAG INTO CARRY
  490 BCC OVERRANGE \ NOT A READING THEREFORE AN OVER RANGE
  500 LDA &FE60
  510 TAX
  520 AND #&80 \SEE IF LAST DIGIT
  530 BEQ DIGIT
  540 \LAST DIGIT FOUND
  550 TXA
  560 AND #1
  570 STA &75 \ STORE MOST SIG BIT
  580 TXA
  590 ROL A:ROL A:ROL A:ROL A \ PUT POLARITY INTO BIT ONE
  600 AND #2 \REMOVE OTHER BITS
  610 EOR #2 \ INVERT THE BIT
  620 CLC
  630 ADC #&FB \ADD OFFSET TO IT
  640 STA &76 \STORE THE SIGN
  650 JMP RECOVER \ FINISHED THIS DIGIT
  660 .DIGIT
  670 TXA
  680 ROR A :ROR A :ROR A :ROR A
  690 AND #&3 \JUST LEAVE ADDRESS BITS
  700 TAY \ PUT ADDRESS INTO Y
  710 TXA \ GET VALUE FROM X
  720 AND #&F \REMOVE OTHER BITS
  730 STA &70,Y
  740 TYA \FIND OUT IF IT IS DIGIT ZERO
  750 BNE RECOVER \BRANCH IF IT IS NOT
  760 \TRANSFER NUMBERS INTO A STRING
  770 LDX #7
  780 LDY #0
  790 .LOOP LDA &6F,X
  800 CLC
  810 ADC #&30
  820 STA VSTRING,Y
  830 INY
  840 DEX
  850 TXA
  860 BNE LOOP
  870 .RECOVER
  880 PLA :TAY
  890 PLA :TAX
  900 PLA
  910 JMP (TEMP)
  920 .OVERRANGE \ INPUT TO DVM TOO HIGH
  930 \ ACTION WITH THIS PROGRAM - BLEEP
  940 LDX #&76 \LSB OF SOUND PARAMETERS
  950 LDY #0
  960 LDA #7 \BLEEP COMMAND
  970 JSR &FFF1 \OSWORD SOUND COMMAND
  980 JMP RECOVER
  990 ]
 1000 NEXT
 1010 CALL INSTAL
 1020 CLS
 1030 REM SET UP SOUND PARAMETER BLOCK
 1040 !&76=&FFF10001
 1050 !&7A=&000100C8
 1060 *KEY0 P.VAL($2614)|M
 1070 *KEY10 CALL &A00|M
 1080 PRINT TAB(0,5);"Digital Voltmeter Patch Now Installed"
 1090 PRINT"KEY f0 Will print reading when ESCAPED"
 1095 PRINT"Over-range reading will cause a BLEEP"
 1100 REPEAT
 1110 A$=""
 1120 PRINT TAB(0,10);"DVM READING ";
 1130 V=VAL($2614)
 1140 PRINT V;" Volts"
 1150 UNTIL FALSE
```

This listing is included in this month's cassette tape offer. See order form on Page 173.

Listing I

Micro Resources limited

Southfield House, 11 Liverpool Gardens, Worthing, Sussex BN11 1RY
Telephone: Worthing (0903) 213174

DUAL CASED WITH CABLES AND MANUAL
£277.39 + VAT = £319.00

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Machine code multi tasking utility. Run up to four processes simultaneously. Supplied on tape – easily transferred to disc. Comprehensive manual. £14

SPELLWISE F
Super fast version of SPELLWISE. Six minutes for the WORDWISE example document. Disk only £22

CONTENTS
Produces a page numbered contents list. For use with any word processor which spools the text file. Disk only £22

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Add comments to your files and automatically LOAD, CHAIN, RUN, etc. Send £1 to cover postage etc. Supplied on tape for transfer to disc.

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Further details obtainable from FLOPPYCAT the DATAWARE catalogue – a reusable 40 track single density 5¼ inch disk with a 5 year manufacturers guarantee – £3 UK postage paid.

All prices except Floppycat include postage anywhere in the world.

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FREEPOST SWINDON SN3 4BR

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TIGER SOFTWARE
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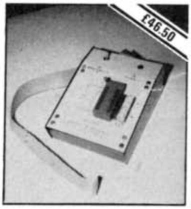
EPROM PROGRAMMER

FOR THE BBC



A very high quality product direct from the manufacturers, contained in attractive sloping box with low insertion force socket and neon indicator for programming fitted as standard, the software adopts the high efficiency method for programming 2764 and 27128. This allows up to 100% faster programming, software in machine code, supplied on cassette and can be placed in eprom. Very easy to use, menu driven with easy to use instructions. This unit is completely self contained with its own power supply and plugs into the user port.

THIS PROFESSIONAL UNIT ALLOWS:

1. Will program: 2716, 2732, 2532, 2764 and 27128 eproms.
2. Copy eprom into memory and compute checksum.
3. Blank check eprom.
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5. Verify byte by byte and compute checksum.
6. allow buffer start area to be changed.
7. All operating system calls may be used when in menu mode.
8. Semi-intelligent programming. Typical time to program a 2764 8k device is approx. 50 sec. depending on the data to be programmed.
9. Additional software supplied to enable your own program (basic or machine code) to be put into eprom with the necessary leader information to allow calling with a *command. Downshift routine to enable basic programs to be run is also supplied.

COST £46.50 please add 15% VAT £1.00 post and package

Also available: RAM/ROM card 16 socket – details on request.

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Access Orders Phone:
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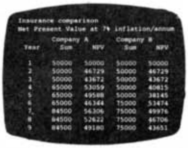

```
Insurance comparison
Net Present Value at 7% inflation/annum
        Company A        Company B
Year    Sum     NPV      Sum     NPV

 1     50000   50000    50000   50000
 2     50000   46729    50000   46729
 3     50000   43672    50000   43672
 4     65000   53059    50000   40815
 5     65000   49588    50000   38145
 6     65000   46344    75000   53474
 7.    84500   56306    75000   49976
 8     84500   52622    75000   46706
 9     84500   49180    75000   43651
```

Over 1,000 cells in upto 26 columns and 99 rows. Data, formulae or text in any cell. Individually variable column widths (1-30 chrs) and decimal places per column. Nine digit accuracy. Various printer formats. Row and column insert and delete with auto formulae adjust. Use any BBC function, eg LOG, SIN, SQR. Many new functions, eg MAX, MIN, SUM DISCOUNT. Replicate formulae and data with auto adjust. Variables. Colour. Four way scrolling while headings stay on screen. Edit. Search. Help. Limits. Access to OS/DFS commands, eg *DISC. Modify. Reference cells by id, eg al, or its headings, eg :JAN:GAS: Full instruction booklet with tutorial, reference and examples.

Cassette £9.99 inc.

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Using advanced disc overlaying techniques Contex has now considerably enhanced the disc version of SPREADSHEET with more than 30 significant extra facilities. In addition to all the features in the standard version the Mk IV includes:

Complete format control, set text and data left or right justified and decimal places globally, by column and/or right down to individual cell settings. Programmable scripted input. Programmable printed output. Sort by column or any section of a column. Merge selected portions of models. Ascii file input from own program or WP. Dynamic calculator using interactive input, existing formulae or data and functions. View formulae in model. More functions. Spool output for WP. Brand new manual. And more! Mk IV will handle models in excess of 1,000 cells (even upto 1,400 cells at a push).

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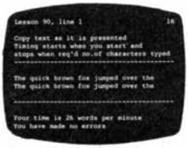

```
Lesson 90, line 1                        16

Copy text as it is presented
Timing starts when you start and
stops when req'd no.of characters typed
-----------------------------------------

The quick brown fox jumped over the
The quick brown fox jumped over the

-----------------------------------------

Your time is 26 words per minute
You have made no errors
```

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Name ....
Address ....
....

** delete as appropriate.*

MU4

X-15 listing

From Page 71

```
  450 IFM%>&7FFF M%=M%-&5000
  460 IF?M%PROCy(?M%AND170,G%-1,H%):E
NDPROC
  470 M%=M%+640
  480 G%=G%-1:IFH%>13 PRINTTAB(G%,H%)
" " ELSEPRINTTAB(G%,H%)R$:H%=H%+1
  490 ENDPROC
  500 DEFPROCx(N%,X%,Y%)
  510 SOUND&11,0,0,1
  520 F%=0:IFN%<42 SC%=SC%+5 ELSEIFN%
<162 ENDPROC ELSEIFN%=168 RL%=FALSE:S
OUND&13,0,0,1:SC%=SC%+10 ELSEIFN%=162
 ML%=FALSE:MF%=FALSE:SOUND&13,0,0,1:S
C%=SC%+50 ELSE SC%=SC%+50
  530 SOUND0,4,5,3:PRINTTAB(X%,Y%)X$
  540 ENDPROC
  550 DEFPROCy(N%,X%,Y%)
  560 SOUND&12,0,0,1
  570 G%=0:IFN%<42 SC%=SC%+5 ELSEIFN%
<162 PRINTTAB(X%,Y%)CHR$32:ENDPROC EL
SEIFN%=168 RL%=FALSE:SOUND&13,0,0,1:S
C%=SC%+10 ELSEIFN%=162 ML%=FALSE:SOUN
D&13,0,0,1:MF%=FALSE:SC%=SC%+50 ELSE
SC%=SC%+50
  580 SOUND0,4,5,3:PRINTTAB(X%,Y%)Y$
  590 ENDPROC
  600 DEFPROCts
  610 IFB%<32T%=B%-14:B%=T%+26 ELSEB%
=38:T%=12
  620 $S%=CHR$17+CHR$(6+RND(6))+B$+ST
RING$(T%DIV3,S$)+STRING$(8,B$)+STRING
$((50-B%)DIV3,S$)
  630 S%?(2+T%)=246:S%?B%=236
  640 ENDPROC
  650 DEFPROCcis
  660 B%=35:T%=3
  670 $S%=CHR$17+CHR$7+B$+STRING$(11,
B$)+STRING$(5,C$)
  680 ENDPROC
  690 DEFPROCgrs
  700 B%=35:T%=3
  710 $S%=CHR$17+CHR$(6+RND(6))+B$+ST
RING$(11,B$)+STRING$(5,S$):S%?B%=236
  720 ENDPROC
  730 DEFPROCg
  740 IF(W%AND12)=12 PRINTTAB(19,RND(
A%?(B%-2)));:VDU17,RND(6),248
  750 N%=RND(6):PROCru
  760 IFW%=128 S%?1=RND(6)+6
  770 IFN%=3 PRINTTAB(19,A%?(B%-2));:
VDU17,15,227
  780 IFN%AND1 IFB%<47 S%?B%=32:B%=B%
+3:S%?B%=236:ENDPROC
  790 IFB%>20 S%?B%=244:B%=B%-3:S%?B%
=237
  800 ENDPROC
  810 DEFPROCru
```

```
  820 IFRL%=TRUE ELSEIFW%>180 ENDPROC
 ELSERT%=T%?A%:RB%=A%?(B%-2)-1:RX%=19
:RY%=(RT%+RB%)DIV2:RL%=TRUE:PRINTTAB(
RX%,RY%)RH$:SOUND3,6,100,50:ENDPROC
  830 RX%=RX%-1:IFRX%<7:RL%=FALSE:SOU
ND&13,0,0,1:ENDPROC
  840 IFRY%>L% IFRY%>RT%:PRINTTAB(RX%
,RY%)RU$:RY%=RY%-1:ENDPROC
  850 IFRY%<L% IFRY%<RB%:PRINTTAB(RX%
,RY%)RD$:RY%=RY%+1:ENDPROC
  860 ENDPROC
  870 DEFPROCmu
  880 IFN%=3:PRINTTAB(19,A%?(B%-2));:
VDU17,15,242
  890 IFML% ELSEIFW%>180 ENDPROC ELSE
 MT%=T%?A%:MY%=A%?(B%-2):MX%=19:ML%=T
RUE:PRINTTAB(19,A%?(B%-2));:VDU17,13,
242:ENDPROC
  900 MX%=MX%-1:IFMF% ELSEIFMX%-6<=MY
%-L% MF%=TRUE:SOUND3,3,50,15 ELSEENDP
ROC
  910 IFMY%=MT% OR MX%<7 ELSEPRINTTAB
(MX%,MY%)MU$:MY%=MY%-1:ENDPROC
  920 PRINTTAB(MX%,MY%)" "
  930 ML%=FALSE:MF%=FALSE:SOUND&13,0,
0,1:ENDPROC
  940 DEFPROCci
  950 IF(W%AND12)=12PRINTTAB(19,RND(A
%?(B%-2)));:VDU17,RND(6),248
  960 N%=RND(6):PROCmu
  970 IFN%AND1IFB%>20 S%?B%=240:B%=B%
-3:S%?1=N%+6:ENDPROC
  980 IFB%<47 B%=B%+3:S%?B%=32
  990 S%?1=N%+6
 1000 ENDPROC
 1010 DEFPROCt
 1020 IF(W%AND12)=12PRINTTAB(19,A%?(B
%-2)-RND(7));:VDU17,RND(6),248
 1030 N%=RND(6):IFN%=1:PRINTTAB(19,(B
%-2)DIV3);:VDU17,15,227
 1040 IFW%=128 S%?1=RND(6)+6
 1050 IFN%AND1 IFT%<24 S%?(2+T%)=244:
T%=T%+3:S%?(2+T%)=247:S%?B%=32:B%=B%+
3:S%?B%=236:ENDPROC
 1060 IFT%>3 S%?B%=244:B%=B%-3:S%?B%=
237:S%?(2+T%)=32:T%=T%-3:S%?(2+T%)=24
6
 1070 ENDPROC
 1080 DEFPROCc
 1090 VDU23,226,0,0,126,0,0,126,0,0
 1100 VDU23,227,255,129,153,145,153,1
45,145,255
 1110 VDU23,230,96,112,252,123,123,25
2,112,96
 1120 VDU23,234,219,0,109,0,0,109,0,2
19
 1130 VDU23,235,109,0,219,0,0,219,0,1
09
 1140 VDU23,236,128,144,208,216,248,2
48,252,255
```

```
 1150 VDU23,237,1,1,9,9,29,95,127,255
 1160 VDU23,240,255,255,195,195,195,2
55,255,255
 1170 VDU23,241,20,28,8,8,8,8,8,0
 1180 VDU23,242,66,66,66,66,66,231,23
1,165
 1190 VDU23,243,0,0,0,1,3,39,255,255
 1200 VDU23,244,255,255,255,255,255,2
55,255,255
 1210 VDU23,246,255,252,248,248,216,2
08,144,128
 1220 VDU23,247,255,255,223,157,137,1
37,129,129
 1230 VDU23,248,146,84,56,56,56,56,84
,146
 1240 VDU23,249,136,73,42,28,255,28,4
2,41
 1250 VDU23,250,144,1,36,137,0,18,33,
132
 1260 ENVELOPE1,1,-3,-3,-3,10,10,10,1
27,-1,-1,-1,126,110
 1270 ENVELOPE2,1,-1,-1,-1,80,80,80,1
27,0,-1,-1,126,126
 1280 ENVELOPE3,1,1,2,100,100,100,5,5
,0,-2,50,126,1
 1290 ENVELOPE4,1,0,0,0,10,5,5,127,0,
-2,-2,126,126
 1300 ENVELOPE5,1,0,0,0,10,5,5,127,-1
,0,-1,126,126
 1310 ENVELOPE6,1,15,-15,-15,4,2,2,5,
0,0,-15,80,80
 1320 HI%=0:HI$="JOE ZERO":SC%=0:NP%=
3
 1330 ENDPROC
 1340 DEFPROCs
 1350 MU$=CHR$32+CHR$8+CHR$11+CHR$17+
CHR$13+CHR$242
 1360 RU$=CHR$32+CHR$8+CHR$11+CHR$17+
CHR$14+CHR$243
 1370 RD$=CHR$32+CHR$8+CHR$10+CHR$17+
CHR$14+CHR$243
 1380 RH$=CHR$17+CHR$14+CHR$243
 1390 D$=CHR$17+CHR$1+CHR$226
 1400 C$=CHR$240+CHR$8+CHR$10
 1410 S$=CHR$244+CHR$8+CHR$10
 1420 Y$=CHR$32+CHR$8+CHR$10+CHR$17+C
HR$7+CHR$249
 1430 X$=CHR$17+CHR$7+CHR$249
 1440 E$=CHR$17+CHR$7+CHR$32+CHR$250+
CHR$17+CHR$3+CHR$249+CHR$17+CHR$7+CHR
$250+CHR$10+STRING$(3,CHR$8)+STRING$(
3,CHR$250)+CHR$11+CHR$11+STRING$(3,CH
R$8)+STRING$(3,CHR$250)
 1450 B$=" "+CHR$8+CHR$10
 1460 R$=" "+CHR$17+CHR$1+CHR$8+CHR$1
0+CHR$241
 1470 P0$=CHR$17+CHR$1+CHR$235+CHR$17
+CHR$3+CHR$230
 1480 P1$=CHR$17+CHR$1+CHR$234+CHR$17
```

→

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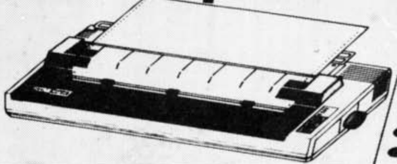

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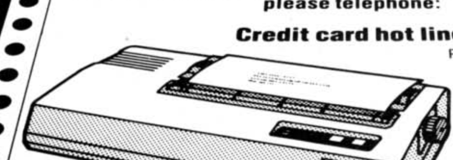

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X-15 listing

From Page 146

```
+CHR$3+CHR$230
 1490 DIMP% 60
 1500 DIMA% 66
 1510 FORI%=0TO66:A%?I%=I%DIV3:NEXT
 1520 $P%=" "+P0$+CHR$13+"  "+CHR$10+
CHR$8+P0$+CHR$13+"  "+CHR$11+CHR$8+P0
$+CHR$13+" "+P1$+CHR$13+"  "+CHR$10+C
HR$8+P1$+CHR$13+"  "+CHR$11+CHR$8+P1$
+CHR$13
 1530 DIMS% 100
 1540 ENDPROC
 1550 DEFPROCexp
 1560 PRINTTAB(5,L%)E$:SOUND0,5,5,30
 1570 SOUND&11,0,0,1:SOUND&12,0,0,1:S
OUND&13,0,0,1
 1580 PROCd(8)
 1590 FORI%=1TO12:VDU19,0,I%MOD6,0,0,
0:PROCd(9):SOUND1,-15,RND(200),3:SOUN
D2,-15,RND(200),3:SOUND3,-15,RND(200)
,3:PROCd(3):NEXT:PROCd(50)
 1600 W%=252:OV%=TRUE
 1610 ENDPROC
 1620 DEFPROCgs
 1630 F%=0:G%=0:D%=0
 1640 U%=&30:O%=0:V%=&6:W%=0
 1650 E%=18887
 1660 L%=10:OV%=FALSE:
 1670 ML%=FALSE:MF%=FALSE
 1680 RL%=FALSE
 1690 VDU19,15,1,0,0,0
 1700 VDU19,14,1,0,0,0
 1710 VDU19,13,1,0,0,0
 1720 FORN%=1TO6
 1730 VDU19,6+N%,N%,0,0,0
 1740 NEXT
 1750 B%=35
 1760 ENDPROC
 1770 DEFPROCge
 1780 *FX21,0
 1790 SOUND&11,0,0,1:SOUND&12,0,0,1:S
OUND&13,0,0,1
 1800 NP%=NP%-1
 1810 IF NP%=0 PROCgx
 1820 PROCscs
 1830 ENDPROC
 1840 DEFPROCgx
 1850 VDU19,7,7,0,0,0
 1860 COLOUR132:CLS
 1870 COLOUR131:VDU28,0,26,19,4:CLS
 1880 COLOUR129:VDU28,1,25,18,5:CLS
 1890 COLOUR7:PRINTTAB(7,1)"X-15"
 1900 PRINTTAB(4,3)"GAME  OVER"
 1910 PRINTTAB(1,6)"YOUR SCORE ";SC%
 1920 PRINTTAB(1,8)"HIGH SCORE ";HI%
 1930 IFSC%<HI%PRINT'" BY "HI$:GOTO19
70
 1940 IFHI%=SC% PRINT''" YOU EQUALED
THE" ELSEPRINT''" YOU BEAT THE"
 1950 PRINT'" HIGH SCORE !"''" ENTER
YOUR NAME"''" > ";
 1960 INPUT""A$:IFLENA$>12GOTO1870 EL
SEHI$=A$:HI%=SC%:GOTO2000
 1970 PRINT'''" RETURN FOR"''" ANOTHE
R GAME"
 1980 REPEATUNTILINKEY(0)=TRUE
 1990 REPEATUNTILGET=13
 2000 PROCsx:SC%=0:NP%=3:COLOUR128:VD
U26:ENDPROC
 2010 DEFPROCscs
 2020 CLS
 2030 VDU23;8202;0;0;0;
 2040 VDU19,10,4,0,0,0
 2050 COLOUR138:PRINTTAB(0,15)SPC40
 2060 COLOUR131:VDU28,0,31,19,17:CLS
 2070 COLOUR129:VDU28,1,30,18,18:CLS
 2080 VDU19,7,7,0,0,0
 2090 COLOUR7
 2100 PRINTTAB(6,1)"X-15"
 2110 PRINTTAB(1,3)"X-15's -> ";NP%
 2120 PRINTTAB(1,5)"SCORE  -> ";SC%
 2130 PRINTTAB(1,7)"HIGH   -> ";HI%
 2140 PRINTTAB(1,9)"BY -> ";HI$
 2150 PRINTTAB(1,11)"RETURN TO START
";
 2160 COLOUR128:VDU26
 2170 FORI%=1TO10:PRINTTAB(RND(20)-1,
RND(9));:VDU17,RND(6),248:NEXT
 2180 REPEATPROCp:PROCd(5):UNTILINKEY
-74
 2190 VDU19,9,1,0,0,0
 2200 COLOUR137:COLOUR7
 2210 VDU28,1,30,18,18:CLS
 2220 PRINTTAB(6,1)"X-15"
 2230 VDU26
 2240 FORI%=9TO-3 STEP-1
 2250 COLOUR128:PROCp:COLOUR137:PROCd
(10)
 2260 IFI%>-1 A$=STRING$(8,STR$I%+" "
):SOUND1,-15,I%*10+100,2:SOUND2,-15,I
%*15+100,2 ELSEIFI%=-1 A$=STRING$(4,"
GO  "):SOUND0,-15,6,20
 2270 C%=(I%+4)MOD4:IFC%=3 C%=4
 2280 *FX19
 2290 VDU19,9,C%,0,0,0:COLOUR7
 2300 PRINTTAB(2,22)A$ TAB(2,24)A$ TA
B(2,26)A$ TAB(2,28)A$
 2310 NEXT
 2320 COLOUR128
 2330 VDU28,0,31,19,17:CLS
 2340 VDU26
 2350 ENDPROC
 2360 DEFPROCp
 2370 IFN%=1 PRINTTAB(5,10)P0$:N%=0 E
LSE PRINTTAB(5,10)P1$:N%=1
 2380 ENDPROC
 2390 DEFPROCd(T%):T%=TIME+T%:REPEAT
UNTIL TIME>T%:ENDPROC
 2400 DEFFNGK
 2410 I%=0
 2420 REPEAT
 2430 I%=I%+1
 2440 IFI%=127 I%=1
 2450 UNTILINKEY-I%
 2460 PRINTTAB(1,16)" O.K. RELEASE KE
Y ";
 2470 REPEATUNTILNOTINKEY-I%:PROCd(10
)
 2480 PRINTTAB(1,16)SPC20
 2490 =-I%
 2500 DEFPROCi
 2510 VDU23;8202;0;0;0;
 2520 FORI%=0TO10
 2530 A$=CHR$(129+I%MOD6)+CHR$157+CHR
$135+CHR$141+"< "+STRING$(5," X-15 ")
+" >"
 2540 PRINTA$'A$
 2550 NEXT:PROCsx
 2560 PROCd(25)
 2570 VDU28,0,19,39,2:CLS
 2580 PRINT''"  PILOT YOUR X-15 THROU
GH THE TUNNELS"'"  AND OVER THE HILLS
 AND CITIES"
 2590 PRINT'"  AVOID THE MISSILES AND
 ASTEROIDS"
 2600 PRINT'"  BOMB AND ROCKET AS MAN
Y FUEL DUMPS"'"  AND MISSILE BASES AS
 YOU CAN"
 2610 PRINT''"  FIRST SELECT YOUR KEY
S >>"
 2620 PRINTTAB(1,14)" HOLD DOWN KEY F
OR UP ";
 2630 J%=FNGK
 2640 PRINTTAB(1,14)" HOLD DOWN KEY F
OR DOWN ";
 2650 K%=FNGK
 2660 PRINTTAB(1,14)" HOLD DOWN KEY F
OR BOMB ";
 2670 Z%=FNGK
 2680 PRINTTAB(1,14)" HOLD DOWN KEY F
OR ROCKETS ";
 2690 R%=FNGK
 2700 PRINTTAB(1,14)SPC30TAB(1,14)" O
.K. ";
 2710 PROCd(40)
 2720 ENDPROC
 2730 DEFPROCsx
 2740 FORI%=1TO10
 2750 SOUND1,-15,RND(200),1
 2760 SOUND2,-15,RND(200),1
 2770 SOUND3,-15,RND(200),1
 2780 PROCd(8)
 2790 NEXT
 2800 ENDPROC
```

This listing is included in this month's cassette tape offer. See order form on Page 173.

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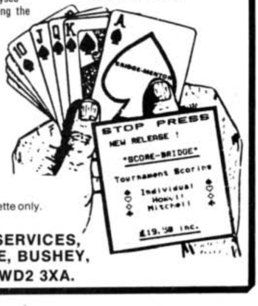

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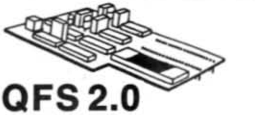

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MICROMAIL

French – with quite a lot of tears . . .

I FELT a great deal of sympathy towards your correspondent A.S. Dawson in Micromail of October, 1984. The problems he encountered in devising his Spanish vocabulary program seem the same as those which I encountered with a French vocabulary program I devised for my daughter as my first programming effort.

At that time, October, 1983, the BBC was relatively new to Western Australia and I had great trouble in finding someone to help me with the problem.

Eventually it was overcome, by brute force, but at the expense of having to type all DATA in inverted commas. Many was the hour!

As I was not using Shift nor a colour monitor I did not encounter the colour problem. I can assure you that my DATA problems were NOT caused by use of indirection operators for at that time I was not up to them in the User Guide!

The tokens only seemed to appear if the program was LISTed before it was run.

I worked out the most commonly used accented letters for myself and these work on the function keys without Shift. I thought the Epson manual might be a help in designing them, but it does not cover all the ones I wanted the way I wanted them.

A copy of the nine I used done on the "Quick March" program from the Micro User of February, 1984, is reproduced here. Given that French characters exist and that there is a very limited number of ways that they can be reproduced in a dot matrix printing head or within the VDU command, it is difficult to see how these could be copyright.

```
    5 MODE6
   10 VDU23,128,12,48,60,10
2,126,96,60,0
   20 VDU23,129,48,12,60,6,
62,102,62,0
   30 VDU23,130,48,12,60,10
2,126,96,60,0
   40 VDU23,131,24,36,60,6,
62,102.62,0
   50 VDU23,132,24,36,60,10
2,126,96,60,0
   60 VDU23,133,24,36,56,24
,24,24,60,0
   70 VDU23,134,24,36,60,10
2,102,102,60,0
   80 VDU23,135,24,36,0,102
,102,102,62,0
   90 VDU23,136,0,60,102,96
,102,60,16,8
  100 VDU23,137,48,12,0,102
,102,102,62,0
  110 *FX255,128
```

The program gives the code for 10 French accented characters to be typed in directly from the function keys without Shift.

Another problem which I have encountered is spaces. I have found it particularly difficult with the formatted listings you use when there are a lot of spaces together.

Even with non-formatted listing it can be difficult to count when the program line is broken over two lines. I now have the answer from my end both from the screen and printout aspects.

A copy of a VDU routine which allows a program to be printed out on an Epson FX-80 with a block character instead of a space is printed below:

```
VDU2,1,27,1,58,1,0,1,0,1,0,
1,27,1,37,1,1,1,0,1,27,1,38
,1,0,1,32,1,32,1,139,1,0,1,
85,1,170,1,85,1,170,1,85,1,
170,1,85,1,170,1,0,1,0,1,0
```

As an older micro user I find it easier to check listings from a printout rather than the screen.

I really look forward to your magazine each month and as I got myself a composite TV-monitor for Christmas my two teenage daughters are now prepared to play some of the games I have typed in from The Micro User.

My husband is next on the list! – **Noreen Kennealy, Nedlands, Western Australia.**

Trak Ball troubles

I WISH to point out the mistake you made in transposing certain connections in the diagram on page 120 of the February 1985 issue of The Micro User.

What is shown as pin 4 should be pin 8, pin 8 should be pin 3 and what is shown as pin 3 should be pin 4. In other words:

4 ==> 8
8 ==> 3
3 ==> 4

as on my original copy.

Fortunately, in my experience supplying the Trak Ball with incorrect voltages like this will do it no harm. – **Mike Cook.**

● Sorry, our mistake. Thank you for pointing it out.

Tip for second processor users

THE following may be of use to those with a 6502 second processor:

It may at some point be necessary to know the Operating System High Water Mark (OSHWM) in the I/O processor, for instance when saving the section of memory containing the definitions of Ascii codes 32-196.

The value of OSHWM will vary depending on the filing system(s) fitted and if the second processor is not being used it is simply the value of PAGE as set up by the operating system.

However with the second processor active, PAGE is set at &800 regardless of the filing systems fitted and so a method is needed to find OSHWM across the tube.

Both the user guide and advanced user guide document OSBYTE call &83 (131) as a means of reading OSHWM, but when used in the second processor it merely returns the value of PAGE in the second processor – &800.

The advanced user guide also details OSBYTE &B4 (180), and says that it is equivalent to OSBYTE &83 as far as reading OSHWM is concerned.

However this is not the case. With the second processor turned off the two calls do indeed return the same result, but when used from within the second processor, OSBYTE &B4 returns the high byte of OSHWM in the I/O processor.

This can then be used to save the definitions of Ascii codes 32-196 that lie in the &600 bytes below it, or as a pointer to free memory in the I/O processor.

The following function returns the value of OSHWM:

```
1000 DEF FN_ioOSHWM
1010 LOCAL A%,X%,Y%
1020 Y%=&FF:X%=0:A%=&B4
1030 =USR(&FFF4) AND &FF00
```

– **Keith Miller, Leighton Buzzard, Beds.**

MICROMAIL

Pilot error

I TYPED in the excellent program Pilot from the February issue. All was working well until I tried to insert blank lines while in the editing mode.

I hastily tried to find out what was causing the weird and wonderful results. Eventually, I found that line 1370 needed a slight modification to put everything right.

Here it is for any other readers who had problems editing. – **C. Belly, Cardiff, Wales.**

```
1370 FORI=MX-NB TO C STEP-
1:FORI1=0TO1:P$(I1,I+NB)=P$
(I1,I):NEXTI1,I
```

● Thanks for the modification. This little gremlin slipped through unnoticed.

Is there life in a Shinwa?

I WAS interested to read the letter from W. Edmunds in the January issue of Micro User, and agree that after spending an evening with a Shinwa CP-80 printer and the manual supplied I was still no better informed as to how I could bring the machine to life.

Unfortunately the manual does not include an interface guide for use with the BBC Micro and the only information I have found useful in it so far has been the internal DIP switch settings and the table of printer control codes.

I suspect the manual has been written around another micro and can only lead to confusion when read by a BBC owner.

The best advice I can give would be to first read the BBC user guide and inderstand the printer VDU commands and control codes before tackling the Shinwa manual.

To get the printer to do anything useful the operation of the printer DIP switches as explained in the printer manual should be studied.

The printer will be supplied with auto line feed off, which means you don't get a program listing even if you have worked out how to turn the printer on and off using Ctrl B and Ctrl C.

Initially the DIP switch should be set to give auto line feed operation. The printer will now give a normal non-emphasised character listing in its default mode after power up.

To change the text type and do all the useful things mentioned in the manual you need to send control codes to the printer to change its default settings.

The printer will accept Escape codes which can be used in Basic programs and these normally follow a VDU command in the program or can be entered from the keyboard before printing starts.

Certain frequently used Escape codes have equivalent Ctrl codes which are sometimes easier to remember for direct keyboard entry. The ESCAPE character is not the Escape key or "E" on the BBC but the decimal code 27 followed by a second decimal parameter, separated by a "," delimiter, which is the control code shown in the printer manual. For example Italic character set "on" would be VDU1 27,52.

For graphics use Watford Electronics can supply printer driver software which is compatible with the Shinwa CP-80 and this should avoid having to cope with the "bit image mode", although nearly all the control codes seem to be Epson compatible.

Most word processor packages will require auto line feed to be "off" to allow underlined text.

To avoid repeated software initialisation of the printer I have extended the DIP switch to a toggle switch on the printer front panel to allow external selection of the line feed option.

The Shinwa printer is normally supplied with the paper out sensor enabled and this will inhibit any printing near the bottom of a single A4 sheet because the sensor is fitted well back from the print head.

Issue an ESCAPE code to disable this function before printing, or change the internal DIP switch setting.

Finally, when printers are driven from software other than the BBC's own OS the ESCAPE commands may be in a different form and the software manual should be consulted.

The Scribe package from Merlin Computer Products allows control codes to be embedded in text to change the text type, etc. However these are of the form 27X where 27 is the decimal code for escape and "X" is the Ascii character equivalent of the decimal values tabled in the printer manual. – **D.C. Hawthorne, Chandlers Ford, Hampshire.**

PROCsearch

I WAS interested in a recent letter to Micromail on the structured programming debate, whose author complained about the difficulty of finding the whereabouts of a PROC in a long program.

This is certainly a valid point, for GOSUB1200 tells you immediately where to look, whereas you have to trace through the whole program to find PROCmissiles.

I have, however, found a method of easily locating a PROC using the TRACE facility. Type TRACEON, followed by PROCmissiles in immediate mode, and the procedure is executed, with line numbers displayed as usual, except the first line.

Why this should be I do not know, but it does mean that one line procedures cannot be traced by this method.

The answer is to ensure that DEFPROC occupies a line of its own, with the rest of the procedure following on another line.

When the program is complete the two lines can be made into one if desired. – **K. Down, Rhyl, Clwyd.**

Streamlined files

I AM trying to streamline my use of View and Viewsheet by using a BOOT file to set up my preferred mode and colour on Shift+Break. I find a difference in their reaction to the commands in the Exec files.

The View version is 2.1 and that of Viewsheet 1.0 I use a BBC Model B with 6502 second processor and Pace discs, OS

Perfection – well almost!

I WRITE about Robin Nixon's program Catalog printed in your December 1984 issue. This program is almost exactly what I needed – well almost, but then no program is perfect!

I was unable to make PROCPROCS work, and I discovered that the problem was my personal habit of separating procedure definitions with blank lines to improve the legibility of listings. By blank lines I mean line numbers maintained by a single space.

The remedy is to split line 1352 and insert the statement:

```
IF G1%=13 GOTO 1390
```

after the PROCRS call.

The DATA statements in line 1550 appear to be unnecessary.

PROCDRIVE would *CAT the alternate drive but would not toggle between drives unless this line was inserted:

```
665 IFDN%=2THEN *DRIVE 2
ELSE *DRIVE 0
```

Also the program would crash if it attempted to CHAIN or LOAD a file that had been SPOOLed or SAVEd. The remedy is to add the following code, either in PROCFX or in a new PROC to be called from line 240:

```
execution_address%=!(&780A
+(PC%/10*8) AND &FFFF: IF
execution_address%=&8023
ENDPROC ELSE
PROCsomething_else
```

I will leave your readers to write their own procedure to deal with machine code files and SPOOLed files. – **Gordon Edgar, Saffron Walden, Essex.**

● ***Want to write to Micromail? The address is: Micromail, The Micro User, Europa House, 68 Chester Road, Hazel Grove, Stockport SK7 5NY.***

1.2, tube 1.1, DFS 1.2 a Juki 6100 and a Microvitec Cub monitor.

I have set up the !BOOT file with the following lines for Viewsheet which sets the TV interlace off, Mode 3, white on blue background with black lines for easy reading and the Juki printer driver:

```
*TV0,1
MODE 3
VDU19,0,4,0,0,0
*SHEET
PRINTER JUKI4
```

*The same sequence of commands substituting *WORD for *SHEET however does not set the colour. I think it must be reset by View when initiated as there is a brief blue flash. Can you help with a sequence which will achieve the required results?*

View also seems to respond differently to Viewsheet as the printer driver is wiped out when a file is loaded after loading the printer driver. Can you help with this one? – **A.M. Cameron, Sauchie, Clackmannanshire.**

● The reason that the screen colours revert to normal when you call View is that on start up, View looks at the current screen mode and does a machine code mode call with that value.

For example, if you're in Mode 3, typing *VIEW will immediately do another Mode 3.

The reason that View does this is to make sure that there isn't a text window defined (which would upset its operation).

Unfortunately, as you discovered, this also resets the colours.

Viewsheet, on the other hand, is cleverer. It first restores default windows (VDU 26 or Ctrl Z equivalent), then just clears the screen (VDU 12 or Ctrl L equivalent). This leaves the colours untouched.

The solution is to set the colours once you're in View. In theory you could put the required control codes in the *EXEC file, but since you are probably using View itself (or *BUILD) to make the *EXEC file, this could be a bit tricky. So define a function key to produce the codes, then call it. Your *EXEC file becomes:

```
*TV0,1
MODE 3
*KEY0¦S¦@¦D¦@¦@¦@¦
*WORD (or *SHEET)
*FX138,0,128
NEW
PRINTER JUKI4
```

Function key 0 is defined to have the same effect as the VDU statement. Then after View or Viewsheet has been called, the *FX inserts that key's code into the keyboard buffer, causing the control codes to be executed.

This method has the advantage that the colours can be set at any time just by pressing f0.

Notice the NEW before the PRINTER command. This gets round the second problem. There is a bugette in View which causes any printer driver loaded before the first NEW (or LOAD) to be very volatile – that is, it disappears at the earliest opportunity.

Typing NEW before it is loaded makes the printer driver act as it should.

Printin proced

THERE are a number of useful procedures for Wordwise and the FX80, some of which can be used or adapted for other printers.

The FX80 bail-bar (paper tear-off) is six normal line feeds (1 inch) from the print position.

To use continuous fan-fold paper conveniently, set the top of the paper to the bail-bar, PL to 60 and TS to 0. Then find from the format display (Option 7) where the exact beginning of the second page comes in the text.

At this point enter BP and set PL to 66 and TS to 6 (or whatever you want). Do not omit the BP!

At the end of the last page set PL to 72 and enter OC12 (form feed). This will stop the paper with the perforation at the bail bar, ready to tear off.

It is possible, with a little care, to print in one piece a document which is too long for Wordwise to store, without the "join" showing.

The control code GF will, of course, only work for purely Ascii, not Wordwise files.

The procedure is to print the first part of the document, count the number of printed lines visible from the top of the last page with the bail-bar and add 6 (unless a special line-spacing has been set with OC27,N (N = 0,1,3 or A): LS does not change the line-spacing for the present purpose).

Subtract the result from 66 (or whatever PL suits the paper), and set PL for the first page of the second part of the document to this value, with TSO.

From the Option 7 display, find the end of the first page, enter BP at this point in the text and set PL and TS to their normal values.

It does work, but care is needed. For instance, make sure that there are no blank lines between the end of the text of the first part and the "End" indicator.

The following !BOOT and function key assignment program has been found extremely useful and may be of interest to other Wordwisepersons.

The key strings are not particularly original, but the scope for creativity is limited and this collection has stood the test of time.

The character N has to be replaced by the appropriate number, taken from the printer manual. – **J.M. Woodgate, Rayleigh, Essex.**

```
   10 REM Program WPKEY
   20 REM Assigns Shift/Con
trol/function keys
   30 REM Author J.M.Woodga
te May 1984
   40 *KEY0¦M¦M¦!¦TI6¦!"
   50 REM NEW PARAGRAPH
   60 *KEY1¦!¦L¦!@¦!¦M¦!@¦!
   70 REM DELETE LINE
   80 *KEY2¦!¦OC27,45,1¦!"
   90 REM UNDERLINE
  100 *KEY3¦!¦OC27,45,0¦!"
  110 REM END UNDERLINE
  120 *KEY4¦!¦OC27,82,N¦!"
  130 REM INTERNATIONAL CHA
RACTER SETS
  140 *KEY5¦!¦OC27,83,0¦!"
  150 REM SUPERSCRIPT
  160 *KEY6¦!¦OC27,83,1¦!"
  170 REM SUBSCRIPT
  180 *KEY7¦!¦OC27,84¦!"
  190 REM CANCEL SUPER/SUBS
CRIPT
  200 *KEY8¦!¦OC27,33,N¦!"
  210 REM PRINT MODE SELECT
ION
  220 *KEY9¦!¦OC27,52¦!"
  230 REM ITALIC FONT
  240 *KEY11¦!¦OC27,53¦!"
  250 REM ROMAN FONT
  260 *KEY12¦!¦CI¦!"
  270 REM CANCEL INDENT
  280 *KEY13¦!¦IN6¦!"
  290 REM INDENT 6
  300 *KEY14~¦!¦D¦!$¦!@¦A¦!
¦D¦!$¦!@¦A¦!$~¦A
  310 REM DELETE MARKERS
  320 REM "~" CHARACTER NOT
 TO BE USED IN TEXT
  330 *KEY15¦!¦OC27,37,N,0¦
!"
  340 REM SELECT ROM OR DOW
NLOAD CHARACTER SET
  350 *WORDWISE
```

Going cross-eyed?

FOR anyone who, like me, goes cross-eyed trying to locate procedures and functions in a long listing, here is a rough and ready but effective routine to insert a couple of blank lines at the start of each function or procedure definition when listing to screen or printer without having to use memory by leaving blank lines in the program.

It works by detecting the passage of the letters DEF through the operating system which is directed through the routine by altering the write character vector with function key 1.

When this occurs two backspace/delete characters (127) are sent to remove the DE already printed, then three

→

From Page 153

carriage returns and line feeds, and six spaces are sent before continuing with the listing.

No attempt is made to miss DEF or DEEEEF(!) within variable names or REM statements etc., and a printer listing is left with the extra DE.

To trap these minor faults would considerably complicate the routine, and hardly seems necessary for a simple programming aid.

Function key 2 resets the vector to the original value. This value of &E0A4 is correct for OS 1.2; if there is any doubt for other OS issues, it can be found by typing:

```
PRINT ~?&20E+256*?&20F
```

If the routine is to be assembled at a different address to &900 the vector address in Key 1 should be altered to suit. – **Peter Vasey, South Shields.**

```
   10 A%=&E0A4
   20 FORN%=0TO2STEP2
   30 P%=&900
   40 [OPTN%
   50 CMP#68:BEQD
   60 CMP#69:BEQE
   70 CMP#70:BEQF
   80 .no JSRA%:JSRclear:RT
S
   90 .D STA&70:JSRA%:RTS
  100 .E LDX#68:CPX&70:BNEn
o:STA&71:JSRA%:RTS
  110 .F LDX#68:CPX&70:BNEno
  120 LDX#69:CPX&71:BNEno
  130 LDA#127:JSRA%:JSRA%
  140 LDA#13:JSRA%:LDA#10:J
SRA%:LDA#13:JSRA%:LDA#10:JS
RA%:LDA#13:JSRA%:LDA#10:JSR
A%
  150 LDA#32:JSRA%:JSRA%:JS
RA%:JSRA%:JSRA%:JSRA%
  160 LDA#68:JSRA%:LDA#69:J
SRA%:LDA#70:JSRA%
  170 .clear
  180 LDA#0:STA&70:STA&71:R
TS
  190 ]
  200 NEXT
  210 *KEY1 ?&20E=0:?&20F=9
|ML.01|M
  220 *KEY2 ?&20E=&A4:?&20F
=&E0|ML.00|M
```

Problems with Music Maker

SINCE our Music Maker program was issued a problem has been traced.

It only arises when Music Maker is used with an operating system or filing system which does not conform exactly with the Acorn specification. Rather surprisingly, we have discovered this includes the Acorn DFS 0.9.

According to specification, any unknown OS or FX call made by a program should be ignored by any service utility which encounters it, and passed on to the next utility in line.

Any calls which go through the system without being trapped are deemed errors and may be dealt with by a user specified routine.

This, of course, is a convenient way of having a machine code program communicate with Basic, and Music Maker does so.

The Acorn 0.9 DFS does pass on the call, but only after attempting some form of DFS operation (we know not what!) which may in itself cause an error.

If you have an Acorn 0.9 DFS or you have had any problems with Music Maker freezing at the end of playing a sequence, please execute the following lines from the keyboard of your BBC Micro, with the Music Maker tape or disc in your drive (remembering to rewind tape if necessary):

```
*BASIC
MODE 7
*LOAD PLAOBJ
?&33BA=7
*SAVE PLAOBJ 3000 3800
```

*If you are using a disc it may be necessary to remove the write protect sticker, and use *ACCESS to unlock and lock the file.*

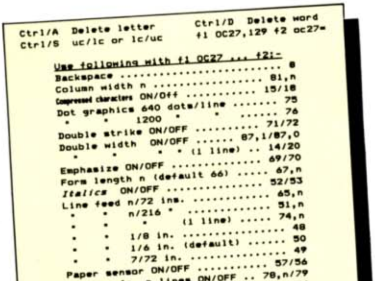
If you have experienced this fault we would be pleased if you would let us know, telling us what sideways ROMs you are

Big in Japan

I REFER to my letter about the Shinwa CP80 in the January issue of the Micro User, headed "Japanese English".

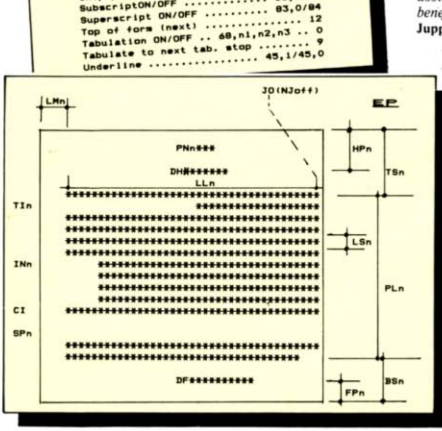
Since writing to you, helpful advice has come from readers, who clearly read Micromail carefully . . .

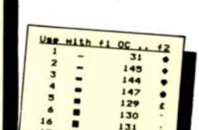
I enclose an aid-memoire to assist any readers who may benefit from it. – **Edmund W. Jupp, Lympstone, Devon.**



```
Ctrl/A  Delete letter          Ctrl/D  Delete word
Ctrl/S  uc/lc or lc/uc         f1 OC27,129 f2 oc27=

     Use following with f1 OC27 ... f2:-
     Backspace ......................... 8
     Column width n .................. 81,n
     Compressed characters ON/Off ..... 15/18
     Dot graphics 640 dots/line ........ 75
       "      "   1200  "     "  ...... 76
     Double strike ON/OFF .......... 71/72
     Double width  ON/OFF ...... 87,1/87,0
       "     "       "   " (1 line) .. 14/20
     Emphasize ON/OFF .............. 69/70
     Form length n (default 66) ..... 67,n
     Italics  ON/OFF ............... 52/53
     Line feed n/72 ins. ............ 65,n
       "    "   n/216 " ............. 51,n
       "    "     "     (1 line) ..... 74,n
       "    "   ........................ 48
       "    "   1/8 in. ................ 50
       "    "   1/6 in. (default) ...... 49
       "    "   7/72 in. ............ 57/56
     Paper sensor ON/OFF ........... 78,n/79
     Skip perfn. n lines ON/OFF .. 83,1/84
     SubscriptON/OFF ............. 83,0/84
     Superscript ON/OFF .............. 12
     Top of form (next) ............... 0
     Tabulation ON/OFF .. 68,n1,n2,n3 .. 9
     Tabulate to next tab. stop ...... 45,1/45,0
     Underline .........................
```





```
Use with f1 OC .. f2
    1    -        31   ●
    2    -       145   ◆
    3    -       144   ♥
    4    ▬       147   ●
    5    ■       129   £
    6    ■       130   -
   16    ■       131   .
   17    ■       133   ●
   19    |       134   ┌
   21    |       149   ┐
   22    ▌       150   ├
   23    ▌       151   ┤
   24    ▌       152   ┬
   25    █       153   └
   26    ◢       154   ┘
   28    ◣       156   |
   29    ◥       157   ─
   30    ◤       158   ┴
  224    '       159   ┼
```

using. We hope this problem has not caused you inconvenience. – **Nic Small, Marketing Manager, F'Soft.**

Basic II glitch

REFERRING to Mr Rouke's letter in your November 1984 issue in connection with inaccuracies in LEN, I wish to point out that this occurs only in Basic II and not in Basic I.

Basic II appears to have a rather inconsistent behaviour pattern in printing out decimal numbers.

With some it seems to work perfectly but not so with others. As an example of the glitch in Basic II if the following is entered:

```
A=45.1:PRINT
LEN(STR$(A$)):PRINT A$
```

returns 11 and 45.09999999 whereas in Basic I it returns 3 and 45.1.

The length it returns is that of the printed number, even if the number is not actually printed, and not that of the number as entered.

It is a pity that Basic II (also HiBasic) has this glitch. No doubt Basic III will eliminate this only to produce new glitches.

There are other difficulties in Basic and to see one of them you can try the following:

```
FOR N= 0 TO 3 STEP .01:
NEXT:PRINT N
```

It will return 3.00999996 in both Basics and not 3.01 as would be expected. This is as a result of the way Basic works in handling decimal numbers.

Various versions of Basic in most machines have this type of inaccuracy, but pocket calculators seems to retain full accuracy right up to the 9th or 10th decimal place.

The moral of the story is to use a calculator to calculate and a computer to compute (manipulate data). – **R. Immelman, Somerset West, South Africa.**

Improving Rover

I ENCLOSE some alterations which I think improve the Rover game from your January 1985 issue.

I give below the details of the amendments:

230 Change order of instructions to give correct print of score.

310 Change x coordinate to agree with line 440 (avoids print of extra character preceding the score).

1045 Flushes INKEY buffer to avoid pick up of any previous key depression.

1070 Gets rid of unprintable COLOUR 4 generations.

1090 Clean up of test for end of line. With 1045 above gives correct dog movement on bonus run.

1180 Inserts "no bonus" print when dog lands on tree.

The whole program has been packed to remove spaces and REMs to avoid "no room at line 850" which sometimes occurs on later screens when scrolling.

I hope these amendments will assist your readers in getting more enjoyment out of this very good game. – **C.G. Brown, Hornchurch, Essex.**

```
230 ........:sc% = sc% +
fly%: PROCfood:.....
310 ....PRINT
TAB(16,1)....PRINT
TAB(16,1)
1045 *FX15,1
1070 FOR i= 0 TO 39
STEP2:COLOUR
RND(3)..........
1090 ................IF x=40
y=y+2: x=0
1180 VDU22,7:a$=CHR$141+
CHR$131+ CHR$136+"No bonus
!!":PRINT TAB(0,10): FOR
i=1 TO 2: PRINT
SPC(12);a$:NEXT: etc
```

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MICROMAIL

Loop jumping

IN the February issue your dismissal of Mr Balcombe's problem of jumping back into a loop such as:

```
   10 FOR X= -1 TO 1
   20 PRINT SQR(X)
   30 NEXT
```

is not the best solution. BBC Basic is so flexible that errors are likely to occur in loops, for example when EVALuating input expressions as in the following program to print out a table of values:

```
   10 INPUT "f(x)=" f$
   20 FOR x= 0 TO 10
   30 PRINT "f(";x;")=";EVA
L f$
   40 NEXT
```

If this is RUN and the function f$="1/(x–5)" is input, then the loop breaks down at x=5 and the remainder is not executed. A better solution is:

```
   10 INPUT "f(x)=" f$
   20 a=0:ON ERROR:PRINT "u
ndefined": a=x+1
   30 FOR x = a TO 10
   40 PRINT "f(";x;")=";EVA
L f$
   50 NEXT
```

and the best (to cover the case of an error when x=10) is:

```
   10 INPUT "f(x)=" f$
   20 a=0:ON ERROR:PRINT"un
defined": a=x+1
   30 IF a<=10 THEN FOR x=a
 TO 10:PRINT "f(";x;")=";EV
AL f$:NEXT
```

Try the program with f$="1/(x–5)" and f$="1/(x–10)" to see how it copes.

Similar problems occur with errors in REPEAT:UNTIL loops and in procedures and user-defined functions.

The solution is to place an ON ERROR routine just before the loop or procedure and to include an error-handling procedure to take care of the error before resuming action, for example:

```
  100 ON ERROR PROChandle_e
rror
  110 PROCsuspect
```

will handle an error that may occur and re-enter the suspect procedure or, better:

```
  100 condition = TRUE:ON E
RROR PROChandle_error_and_s
et_condition
  110 IF condition THEN PRO
Csuspect
```

can be written to handle the error and set a condition so that the suspect procedure is only re-entered if the condition is true.

The problem with BBC Basic is that any error kills the Basic stack and forgets about loops, procedures etc. But it can be turned to advantage to extricate oneself from deeply nested loops and procedures by purposely creating an error.

My favourite, which I use in all my published programs, is to use the Escape key to come out of any depth of nesting and return control of the program to a choice of options at a specified line, say 1000, using the following:

```
   100 ON ERROR PROCch
eck_escape: PROChandle
_error
   .................
   .................
 32000 DEFPROCcheck_es
cape:IF ERR<> 17 THEN
ENDPROC
 32010 ON ERROR GOTO 1000
 32020 0
```

When an error occurs, PROCcheck_escape tests whether the Escape key has been touched (error 17). If it has not, the procedure ends and passes on to the error-handling procedure.

If it has, the syntax error in line 32020 sets off the ON ERROR in line 32010 and directs control back to line 1000 where the main menu of action occurs.

After pressing Escape the Basic stack and all loops are cleared, returning the program to a pristine pure state ready to continue with further choices.

Dirty programming? Of course! But the BBC Micro's ON ERROR is a dirty command and it takes one to clean one! – **Dr David Tall, Kenilworth, Warks.**

Shifting fields

WHEN trying out a program on my BBC B I came across an interesting effect.

The program was:

```
   10 MODE 7
   20 FOR A=1 TO 40
   30 PRINT A,A;
   40 NEXT A
```

According to the User Guide the computer defaults to four print fields in Mode 7 and numbers are printed to the right of each field.

As far as I understand it line 20 tells the computer to print the first value of A in the first and second print field, the second value of A in the third and fourth print field, the third value of A in the first and second print field on a new line, etc.

This works fine for a few lines but then the print fields shift.

I cannot find anything in the User Guide, or any other book I have, to explain why this happens. Can you explain it for me? – **Janet C. Quarton, Lochgilphead, Argyll.**

● It looks as if you've found a quirk in the way the BBC calculates field positions, unless anyone else knows why it happens.

A date with the coffee capers

I WONDER if you might be interested in what I think is a discovery that I have made?

I had been trying for some weeks to make a back-up copy of a "protected" disc that I have bought, with no success.

During one of my sessions my wife spilled a cup of sweet coffee over the protected disc and a blank disc as well. They were in such a mess that in order to clean them I had to open their protective covers and soak them in water.

I put them on a warm shelf to dry, but my wife pushed them to one side, "out of the way", as she put it.

*I forgot about them for a couple of weeks then when I came back to them they were stuck together. I didn't know which was which so I tried to *CAT. them, but to no avail (dreaded DISC ERROR 18 00/00).*

*You can imagine my amazement when I discovered that a little judicious use of Disc Doctor's *DZAP revealed that BOTH discs contained information!*

The "blank" disc seemed to have the information backwards, as indicated by the reversed catalogue number 5841.

Fortunately I am into electronics so I did a little jiggery-pokery on the drives and in no time had them running backwards. There it was – an exact copy of my "protected" disc, only in reverse.

I can only imagine that this is just another example of the well-known print through effect observed on cassette and reel-to-reel tapes due to the adjacent coils being stored in close proximity.

I am now trying to make a second copy of the reversed disc, which will be the correct way round, of course.

If this experiment turns out to be successful it will render all methods of protection valueless to anyone with a little technical skill and a lot of imagination. – **D. Brandon, Chester.**

● It certainly makes a fool out of software houses who prevent us making legitimate backup copies of our programs.

Our intrepid editor even tried to see if beer had the same effect – until he noticed the date on your letter was April 1.

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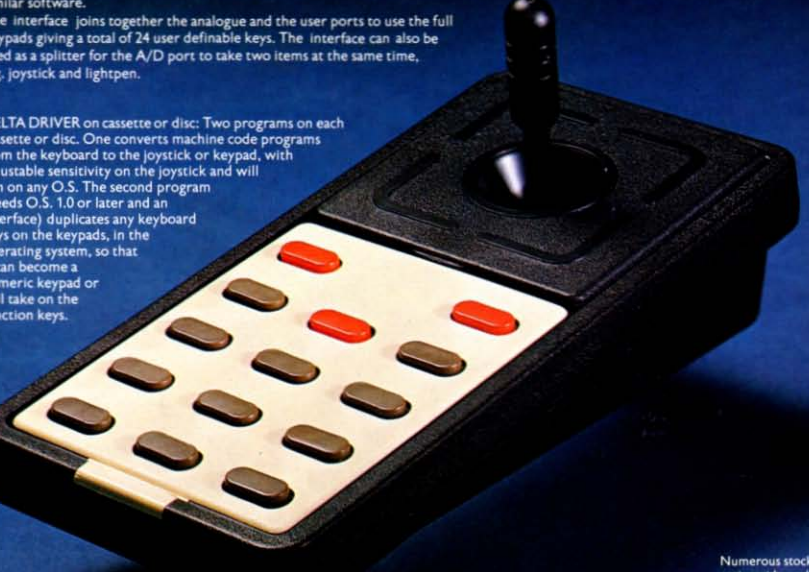

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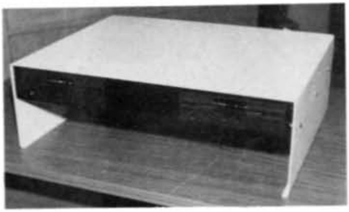

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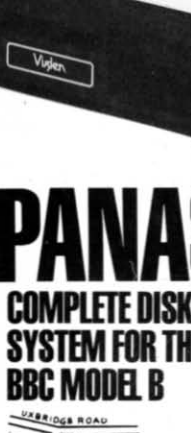
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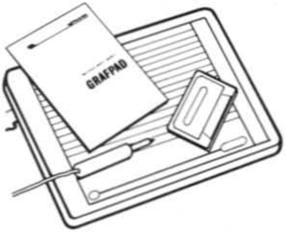

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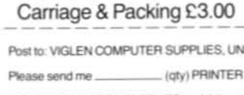

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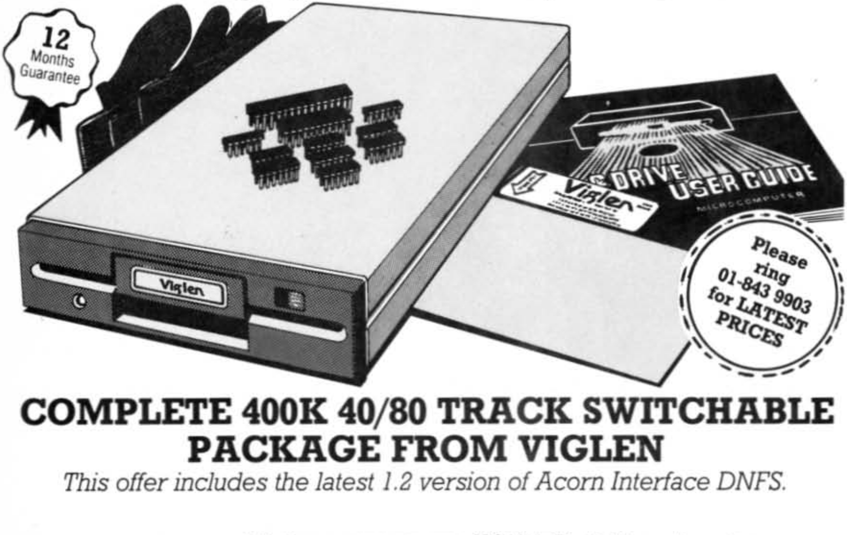

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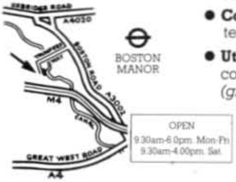

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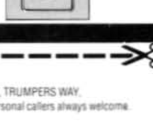

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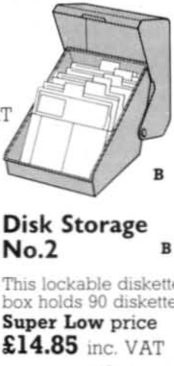

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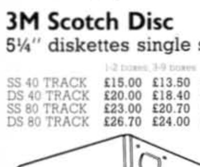

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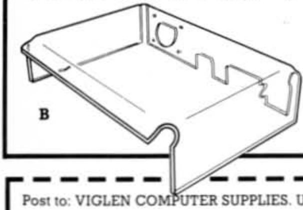

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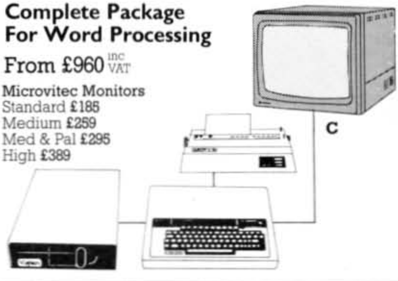

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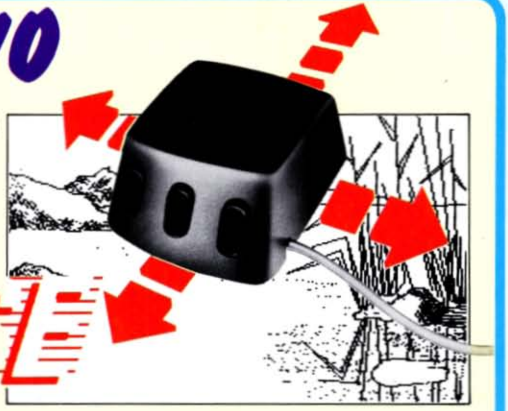

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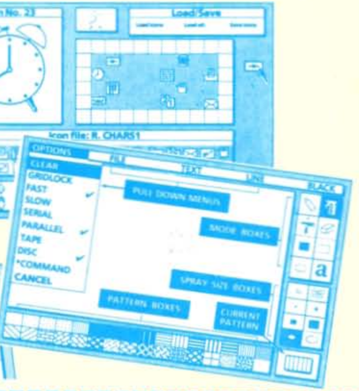
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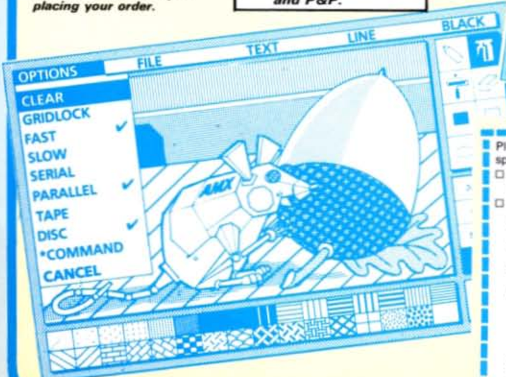
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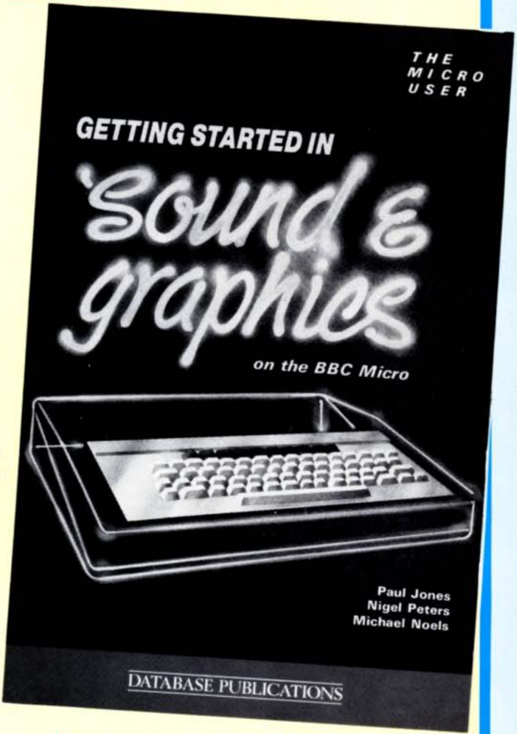

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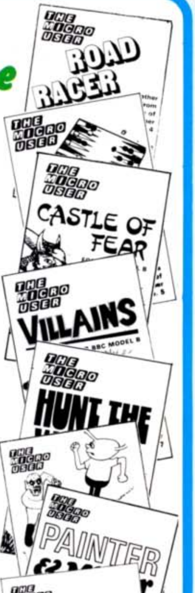
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APRIL: King Kong, Nim, and other programs from Vol. 1, No. 2.

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OCTOBER: Fishing, a compulsive day's angling. **Joykey,** convert programs to joystick. **Pentest** and **Bellringer,** for Micro User lightpens. **Contours,** an educational program. **Link** BBC Micros to each other. **Plus** all the listings from the first Electron User.

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DECEMBER: Tower, rescue London's treasure. **Santa,** help Father Christmas. **VDU 23,** an invaluable character defining utility. **Paged,** graphic techniques. **Plus** all the listings from the third issue of Electron User.

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JUNE: Roadracer, 3D driving action. **Quadline,** four-in-a-line logic game. **Monitor,** machine code debugging routines. **Toolkit,** 8271 disc controller explored. **Areas,** easy maths. **Spell,** spelling education.

JULY: Doomrun, deep space drama. **Backgammon,** the classic board game. **Keys,** user defined key editor. **Save?** and **Tidisk,** disc utilities. **Alice1** and **Alice2,** mini-adventures. **Terminal1** and **Terminal2,** two communication programs. **Acoustic,** software for the Body Build Modem.

AUGUST: Castle, an enthralling adventure program. **Gridman,** a high speed game of strategy. **Tedit,** a superb Teletext editor. **Dsquare,** simple number fun. **Dedit,** a versatile disc editor. **Input,** the ultimate general input routine. **Bells,** Alice's mini-adventure.

SEPTEMBER: Villains, save your crystals from the evil onslaught. **Rollerball,** an intriguing game of strategy and agility. **Microterm,** comms terminal. **T/Textdump,** Mode 7 screen dump. **Numbersign,** simple number skills test for infants.

OCTOBER: Wampus, explore the labyrinth and slay the beast. **Balloon,** brave the caves, escape the Goulogs. **Splits,** split screen utility. **Pageram,** paged RAM programs. **Input1/2,** alternative inputs for the disabled. **Morecol,** extended colours. **D/A,** a waveform generator. **Integer,** direct addressing speed.

NOVEMBER: Buster, line up the diamond blocks. **Duel,** two player action. **Seaside,** picture fun for the young. **M7letters,** teletext large letters. **Dscload,** loading large disc files to &E00. **6502,** second processor programs. **Synth,** musical Body Building programs.

DECEMBER: Painter, can you paint the precipitous pyramid? **Miner,** delve into the deadly mine's depths. **Snowvad** and **Carol,** two seasonal programs. **Garden,** shape-matching for infants. **Medit,** a memory editor. **Catalog** and **Save,** useful disc utilities. **Ladders,** Alice's mini-adventure. ***Plus Omega Probe – a full length machine code arcade game.***

JANUARY 1985: Rover, guide our retriever to his rations. **Backgammon,** an exciting two player version. **Matchwood,** shape recognition for infants. **Messages,** machine code printing. **Speedtext,** display text at different rates. **Search,** a powerful programming tool. **Second processor,** Body Building and graphics routines. ***Plus Galactic Tycoon, our superb free game.***

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APRIL: X15, sideways-scrolling arcade spectacular. **Mornington Crescent,** fun and games on the London underground. **Calculator,** superb AMX mouse mathematics utility. **Dithering,** useful colour mixer. **Chatterbox,** powerful speech chip procedures. All the programs from Alice, Body Building and Machine Code games. ***Plus Rabbit Run – a full length machine code arcade game.***

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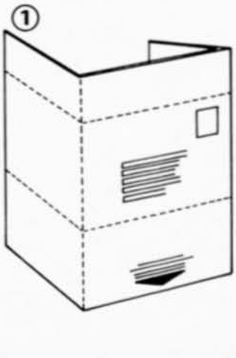

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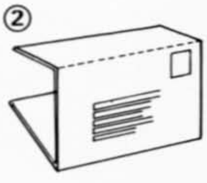

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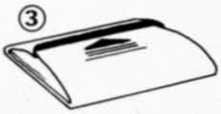

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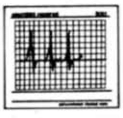

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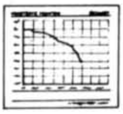

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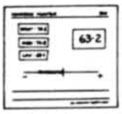

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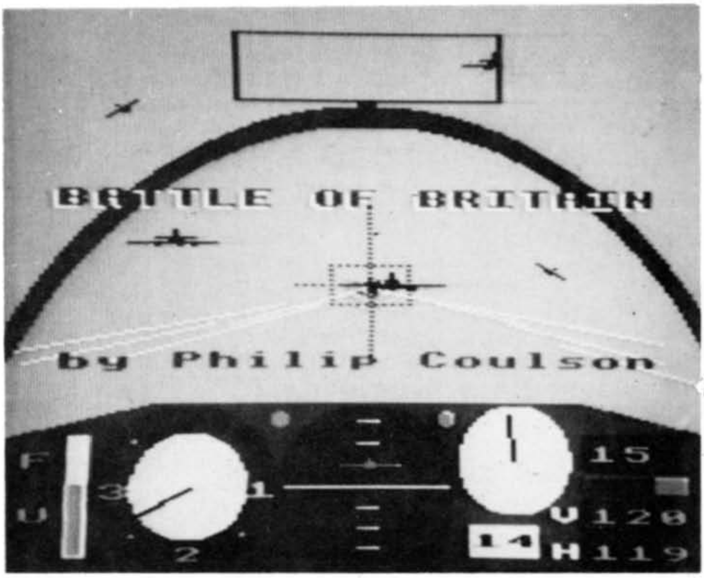

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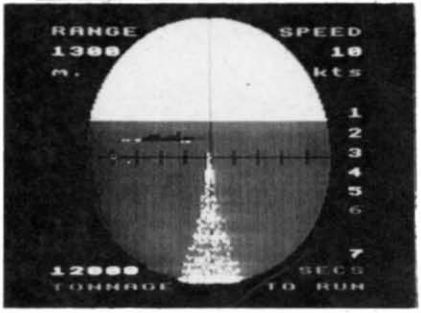

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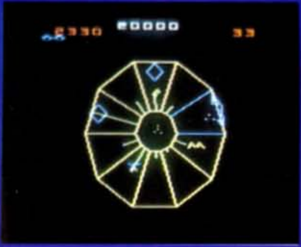

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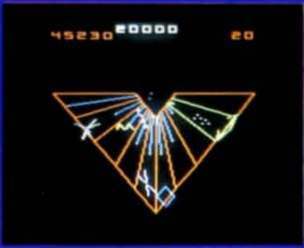

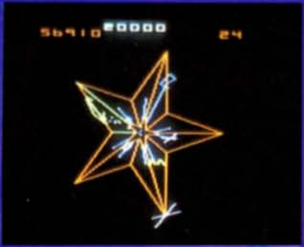

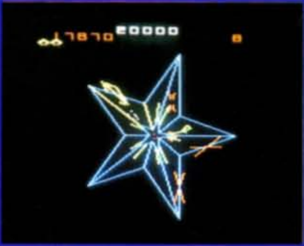

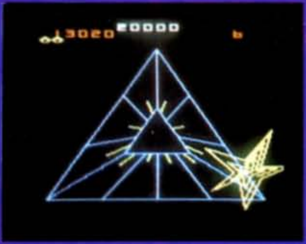

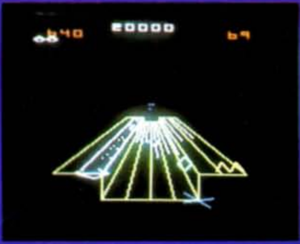

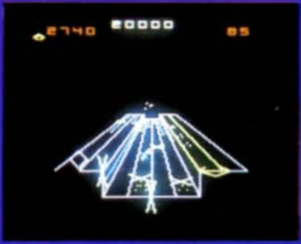

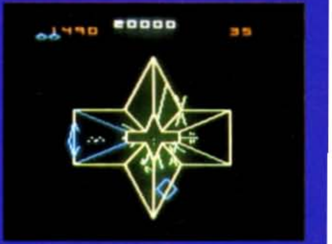

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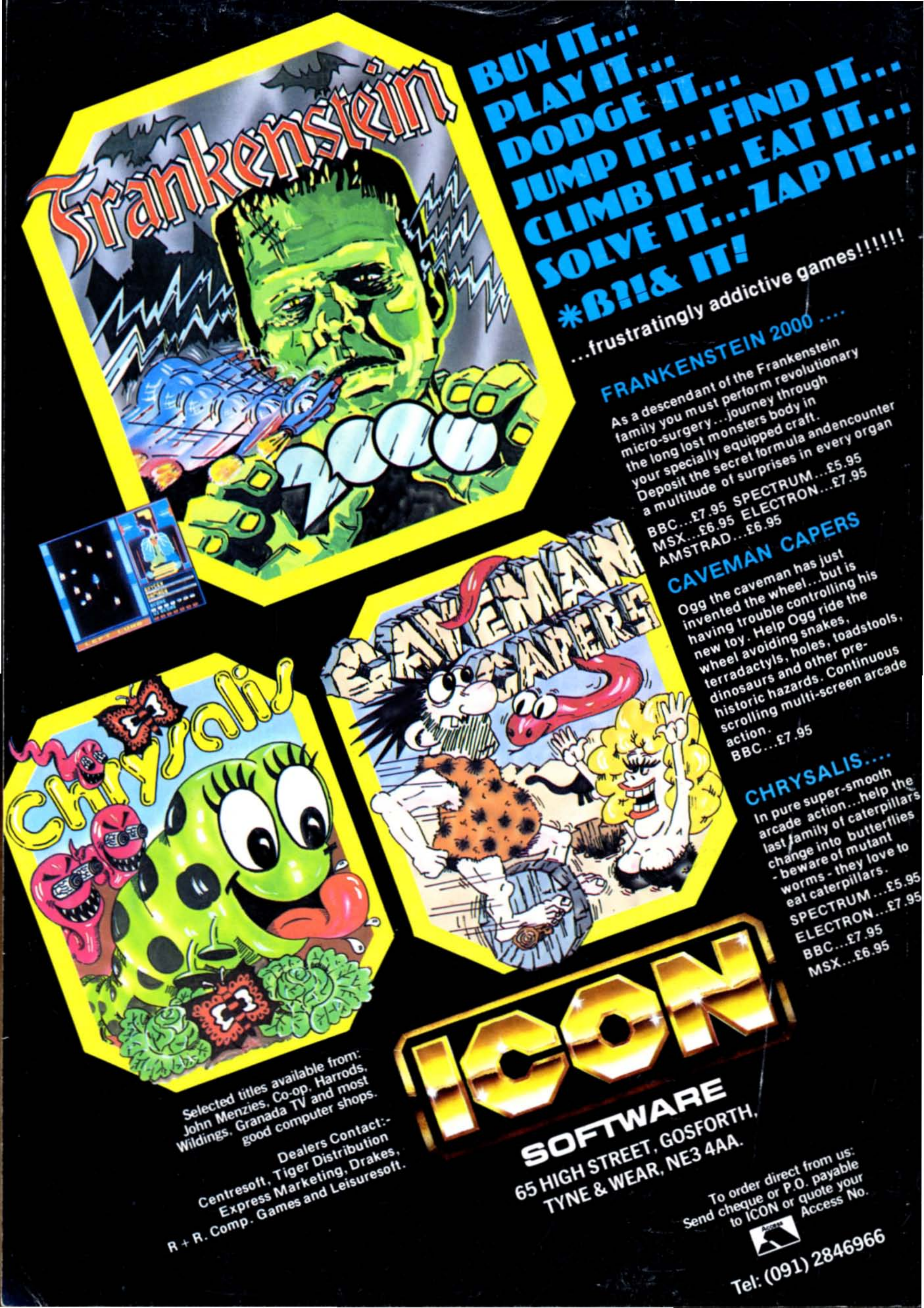

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